

Example 246(-)(5S,3'S) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cycloheptenyl)-1H-[1]benzopyrano[3,4-f]quinolineMS (DCI/NH₃) m/z 418 (M+H)⁺;¹H NMR (300 MHz, DMSO-d₆) □ 8.70 (s, 1H), 7.96 (d, 1H), 6.65 (d, 1H), 6.64 (d, 1H), 6.21 (s, 1H), 5.55 (ddd, 1H), 5.53 (d, 1H), 5.46 (s, 1H), 5.31 (ddd, 1H), 3.65 (s, 3H), 2.45 (m, 1H), 2.14 (m, 3H), 2.05-1.84 (m, 4H), 1.46 (m, 1H), 1.29 (s, 3H), 1.27-1.15 (m, 4H), 1.04 (s, 3H);¹³C NMR (400 MHz, DMSO-d₆) □ 145.3, 144.9, 144.0, 143.1, 133.7, 132.1, 131.6, 131.2, 128.1, 126.1, 118.3, 117.9, 116.5, 114.4, 113.3, 112.1, 74.5, 59.3, 49.5, 38.9, 29.5, 29.0, 28.7, 27.8, 27.2, 26.3, 23.8;HRMS calcd m/z for C₂₇H₃₁NO₃: 417.2304 (M)⁺. Found: 417.2319.[□]²³D=-134° (c 1.15, CHCl₃).Example 247(-)(5S,3'R) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cycloheptenyl)-1H-[1]benzopyrano[3,4-f]quinolineMS (DCI/NH₃) m/z 418 (M+H)⁺;¹H NMR (300 MHz, DMSO-d₆) □ 8.66 (s, 1H), 7.97 (d, 1H), 6.65 (d, 1H), 6.59 (d, 1H), 6.45 (d, 1H), 6.22 (s, 1H), 5.93 (ddd, 1H), 5.72 (ddd, 1H), 5.50 (d, 1H), 5.45 (s, 1H), 3.65 (s, 3H), 2.38 (m, 1H), 2.13 (s, 3H), 2.04 (m, 1H), 1.82-1.70 (m, 2H), 1.50-1.05 (m, 5H), 1.30 (s, 3H), 1.02 (s, 3H);¹³C NMR (400 MHz, DMSO-d₆) □ 145.2, 144.8, 143.8, 143.2, 133.9, 133.6, 131.1, 130.8, 128.0, 126.1, 118.6, 118.0, 116.5, 114.4, 113.4, 112.2, 75.3, 59.2, 49.4, 41.9, 30.0, 29.6, 28.3, 28.0, 27.3, 26.1, 23.9;HRMS calcd m/z for C₂₇H₃₁NO₃: 417.2304 (M)⁺. Found: 417.2288.[□]²³D=-122° (c 0.74, CHCl₃).Example 248 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-phenyl-1H-[1]benzopyrano[3,4-f]quinoline¹H NMR (300 MHz, DMSO), □ 8.53 (s, 1 H), 7.93 (d, J=8.7 Hz, 1 H), 7.20-7.14 (m, 5 H), 6.73 (d, J=8.7 Hz, 1 H), 6.66 (s, 1 H), 6.42 (d, J=8.9 Hz, 1 H), 6.33 (d, J=8.7 Hz, 1 H), 6.22 (d, J=1.7 Hz, 1 H), 5.37 (s, 1 H), 3.55 (s, 3 H), 1.80 (s, 3 H), 1.24 (s, 3 H), 1.14 (s, 3 H); ¹³C NMR (300 MHz, DMSO), □ 145.7, 144.8, 143.8, 143.6, 139.3, 133.1, 132.7, 130.2, 128.3, 127.8, 127.6, 127.5, 126.4, 126.1, 123.8, 118.4, 117.8, 114.1, 114.0,

112.8, 112.2, 74.9, 59.0, 49.7, 29.7, 28.4, 23.2; MS ESI m/z 400 ($M+H$)⁺; HRMS calcd for $C_{26}H_{25}NO_2$ is 399.1834. Found 399.1839.

Example 249 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3,5-difluorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO), δ 8.68 (s, 1 H), 7.95 (d, $J=8.4$ Hz, 1 H), 7.06 (tt, $J=9.2, 2.2$ Hz, 1 H), 6.82 (dd, $J=8.1, 1.8$ Hz, 2 H); 6.77 (d, $J=8.4$ Hz, 1 H), 6.70 (s, 1 H), 6.48 (d, $J=8.4$ Hz, 1 H), 6.42 (d, $J=8.4$ Hz, 1 H), 6.32 (d, $J=1.5$ Hz), 5.42 (s, 1 H), 3.56 (s, 3 H), 1.84 (d, $J=1.1$ Hz, 3 H), 1.25 (s, 3 H), 1.15 (s, 3 H); ¹³C NMR (300 MHz, DMSO), δ 163.6 (d, $J=12.81$ Hz), 160.4 (d, $J=12.81$ Hz), 145.9, 145.2, 144.5, 144.4 (t, $J=7.93$ Hz), 143.6, 143.3, 133.1, 129.0, 127.3, 126.6, 118.2, 117.9, 117.2, 114.5 (d, $J=6.1$ Hz), 112.4, 111.4, 103.5, 73.8, 64.9, 59.1, 49.9, 29.6, 28.5, 23.2; MS ESI m/z 436 ($M+H$)⁺; HRMS calcd for $C_{26}H_{22}F_2NO_2$ is 435.1646. Found 435.1657.

Example 250 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3,4,5-trifluorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO), δ 8.76 (s, 1 H), 8.02 (d, $J=8.4$ Hz, 1 H), 7.08 (dd, $J=6.98, 1.8$ Hz, 1 H), 6.86 (dd, $J=7.3, 2.2$ Hz, 1 H), 6.83 (d, $J=8.8$ Hz, 1 H), 6.73 (s, 1 H), 6.55 (d, $J=8.8$ Hz, 1 H), 6.47 (d, $J=8.8$ Hz, 1 H), 6.38 (d, $J=1.5$ Hz, 1 H), 5.46 (s, 1 H), 3.62 (s, 3 H), 1.88 (d, $J=1.1$ Hz, 3 H), 1.30 (s, 3 H), 1.13 (s, 3 H); ¹³C NMR (300 MHz, DMSO), δ 146.0, 145.3, 143.6, 143.1, 133.1, 128.7, 127.3, 126.7, 118.1 (d, $J=15.87$ Hz), 117.1, 116.0, 115.9, 115.8, 114.05 (d, $J=9.16$ Hz), 113.0, 112.7, 112.4, 73.5, 59.1, 49.8, 29.7, 28.4, 23.3, MS ESI m/z 454 ($M+H$)⁺; HRMS calcd for $C_{26}H_{22}F_3NO_2$ is 453.1552. Found 453.1571.

Example 251

5-butyl-2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-tert-butyldimethylsilyl ether of core 7 (0.057 g, 0.122 mmol) was dissolved in 1,2-dichloroethane (5 ml), cooled to -10°C, and treated dropwise with $BF_3 \cdot OEt_2$ (46 mL, 0.366 mmol). The resulting deep green solution was treated dropwise with an ethereal solution of *n*-butylmagnesium chloride (0.19 ml of a 2M / Et_2O solution, 0.380 mmol). The color changed to yellow-brown. The reaction mixture was partitioned between saturated aqueous sodium bicarbonate and ethyl acetate, the aqueous layer extracted with ethyl acetate, the combined organics washed with brine, dried ($MgSO_4$), and concentrated to a yellow oil.

The resulting yellow oil was dissolved in THF (5 ml), cooled to 0°C, and treated with tetrabutylammonium fluoride solution (0.14 ml of a 1M / THF solution, 0.14 mmol). After 10 minutes, the mixture was quenched by the addition of saturated aqueous ammonium chloride and pH 7.0 buffer, and the layers were separated. The aqueous layer was extracted with ethyl acetate, the combined organics washed with brine, dried (MgSO₄), and concentrated. The residue was purified by silica gel chromatography eluting with 25% ethyl acetate in hexanes to give 0.032 g (72%) of the desired compound.

¹H NMR (300 MHz, DMSO-d₆) δ 8.70 (s, 1H), 7.90 (d, J=8 Hz, 1H), 6.60 (d, J=8 Hz, 1H), 6.59 (s, 1H), 6.49 (d, J=8 Hz, 1H), 6.16 (br s, 1H), 5.61 (m, 1H), 5.44 (br s, 1H), 3.63 (s, 3H), 2.16 (s, 3H), 1.77-1.63 (m, 1H), 1.47-1.26 (m, 3H), 1.17 (s, 3H), 1.16 (s, 3H), 0.83 (m, 3H); ¹³C NMR (75 MHz, DMSO-d₆) δ 145.7, 144.9, 143.9, 143.1, 133.5, 133.3, 127.5, 126.4, 117.9, 116.3, 114.2, 113.4, 112.1, 73.2, 59.3, 49.7, 34.1, 29.1, 28.9, 23.9, 18.6, 13.4; MS (DCI/NH₃) *m/e* (M+H)⁺ 366; Anal. calcd for C₂₃H₂₇NO₃·1.25H₂O: C, 71.20; H, 7.66; N, 3.61. Found: C, 71.48; H, 7.32; N, 3.52.

The C-5 lactol-9-TBS ether of core 7 and 3-cyclopentenyl trimethylsilane were processed as above to give a 1:1 diastereomeric product mixture which was subjected to HPLC on an (R,R) WHELK-O 1 column eluting with 2% ETOH in hexanes to provide the individual enantiomers.

Example 252

(-)(5S,3'S) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclopentenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) *m/z* 390 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.68 (s, 1H), 8.01 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.51 (d, 1H), 6.22 (s, 1H), 5.72 (dd, 1H), 5.41 (d, 1H), 5.40 (s, 1H), 5.17 (dd, 1H), 3.63 (s, 3H), 2.90-2.80 (m, 1H), 2.41-2.32 (m, 1H), 2.23-2.10 (m, 1H), 2.06 (s, 3H), 1.89-1.71 (m, 2H), 1.30 (s, 3H), 1.08 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) δ 145.5, 145.0, 143.9, 143.4, 133.5, 132.3, 132.2, 130.2, 128.1, 126.4, 117.8, 116.9, 116.4, 114.4, 113.4, 111.9, 75.7, 59.3, 49.5, 48.7, 31.6, 29.8, 27.6, 27.1, 24.2;

HRMS calcd *m/z* for C₂₅H₂₇NO₃: 389.1991 (M)⁺. Found: 389.1994.

[α]_D²³ = -120° (c 0.800, CHCl₃).

Example 253

(-)-(5S,3'R) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclopentenyl)-

1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 390 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 8.67 (s, 1H), 8.02 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.53 (d, 1H), 6.25 (s, 1H), 5.77 (ddd, 1H), 5.69 (ddd, 1H), 5.47 (s, 1H), 5.37 (s, 1H), 3.66 (s, 3H), 2.90 (m, 1H), 2.34-2.13 (m, 2H), 2.10 (s, 3H), 1.55-1.41 (m, 2H), 1.31 (s, 3H), 1.04 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) □ 145.5, 144.9, 144.0, 143.9, 133.6, 132.0, 131.7, 131.5, 127.9, 126.2, 117.7, 117.6, 116.5, 114.4, 113.3, 111.9, 76.1, 59.3, 49.4, 48.6, 31.7, 29.5, 27.1, 24.6, 23.7;

HRMS calcd m/z for C₂₅H₂₇NO₃: 389.1991. Found: 389.1998.

[□]²³D=-132° (c 0.76, CHCl₃).

Example 254 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3,4-
difluorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.65 (s, 1H), 7.96 (d, J=8.8 Hz, 1H), 7.31-7.17 (m, 2H), 6.98-6.95 (m, 1H), 6.76 (d, J=8.8 Hz, 1H), 6.67 (s, 1H), 6.48 (d, J=8.4 Hz, 1H), 6.38 (d, J=8.4 Hz, 1H), 6.29 (d, J=1.5 Hz), 5.40 (s, 1H), 3.57 (s, 3H), 1.82 (d, J=1.5 Hz), 1.25 (s, 3H), 1.14 (s, 3H);

¹²C-NMR (75 MHz, DMSO-d₆) □ 145.9, 145.1, 143.6, 143.3, 137.3, 132.9, 129.5, 127.4, 126.6, 125.2, 118.3, 117.8, 117.3, 117.1, 117.0, 116.8, 114.4, 114.3, 112.3, 73.8, 59.1, 49.8, 29.7, 28.4, 23.3;

HRMS calcd for C₂₆H₂₂NO₂F₂ is 435.1646. Found 435.1638.

Example 255 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(4-fluorophenyl)-

1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 418 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 8.58 (s, 1H), 7.95 (d, J=8.8 Hz, 1H), 7.23-7.19 (m, 2H), 7.03 (dd, J=8.8, 8.8 Hz, 2H), 6.74 (d, J=8.8 Hz, 1H), 6.66 (s, 1H), 6.44 (d, J=8.8 Hz, 1H), 6.34 (d, J=8.8 Hz, 1H), 6.24 (d, J=1.5 Hz), 5.38 (s, 1H), 3.57 (s, 3H), 1.80 (d, J=1.5 Hz), 1.24 (s, 3H), 1.14 (s, 3H);

HRMS calcd for C₂₆H₂₄NO₂F is 417.1740. Found 417.1745.

Example 2562,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-trifluoromethylphenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS APCI m/z 468 (M+H)+;

¹H NMR (300 MHz, DMSO), δ 8.62 (s, 1 H), 7.97 (d, J=8.8 Hz, 1 H), 7.61-7.41 (m, 3 H), 7.36 (s, 1 H), 6.75 (s, 1 H), 6.44 (d, J=8.4 Hz, 1 H), 6.35 (d, J=8.4, 1 H), 6.30 (d, J=1.5 Hz, 1 H), 5.40 (s, 1 H), 3.52 (s, 3 H), 1.80 (d, J=1.5 Hz, 3 H), 1.24 (s, 3 H), 1.15 (s, 3 H); ¹³C NMR (300 MHz, DMSO), δ 145.9, 145.0, 143.5, 140.9 (d, J=17.01 Hz), 140.9, 133.0, 132.6, 129.3, 129.2, 127.4, 126.6, 124.4, 118.3, 118.0, 117.4, 114.5 (d, J=7.32 Hz), 112.3, 74.2, 58.9, 49.8, 29.5, 29.4, 23.3.

HRMS calcd for C₂₇H₂₄F₂NO₂ is 467.1708. Found 467.1708.

Example 257 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3,5-bistrifluoromethylphenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS APCI m/z 536 (M+H)+;

¹H NMR (300 MHz, DMSO), δ 8.69 (s, 1 H), 8.00 (d, J=8.8 Hz, 1 H), 7.96 (s, 1 H), 7.80 (s, 2 H), 6.90 (s, 1 H), 6.79 (d, J=8.4 Hz, 1 H), 6.46 (d, J=8.8 Hz, 1 H), 6.39 (d, J=1.3 Hz, 1 H), 6.37 (d, J=8.4 Hz, 1 H), 5.43 (s, 1 H), 3.51 (s, 3 H), 1.80 (d, J=0.73 Hz, 3 H), 1.24 (s, 3 H), 1.15 (s, 3 H); ¹³C NMR (300 MHz, DMSO), δ 146.1, 145.3, 143.6, 142.9, 133.2, 130.1, 129.7, 129.5, 127.2, 126.7, 124.9, 118.2, 117.2, 114.8, 112.3, 73.5, 58.8, 49.8, 29.4, 28.3, 23.3.

HRMS calcd for C₂₈H₂₂F₆NO₂ is 535.1582. Found 535.1573.

Example 2582,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-trifluoromethyl-4-chlorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 502 (M+H)+;

¹H NMR (300 MHz, DMSO), δ 8.70 (s, 1 H), 7.97 (d, J=8.8 Hz, 1 H), 7.70-7.60 (m, 3 H), 6.78 (s, 1 H), 7.55 (s, 1 H), 6.46 (d, J=8.8 Hz, 1 H), 6.38 (s, 1 H), 6.36 (d, J=8.8 Hz, 1 H), 5.41 (s, 1 H), 3.53 (s, 3 H), 1.79 (s, 3 H) 1.28 (s, 3 H), 1.14 (s, 3 H); ¹³C NMR (300 MHz, DMSO), δ 166.9, 146.0, 145.2, 143.6, 143.1, 139.6, 134.1, 133.0, 131.7, 131.5, 128.6, 127.3, 126.7, 114.6, 112.3, 73.7, 59.0, 49.8, 67.4, 29.6, 29.8, 28.3, 23.3, 23.2, 22.4, 13.8, 10.8.

HRMS calcd for C₂₇H₂₂ClF₂NO₂ 501.1319. Found 501.1326.

Example 2592,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-methylpropyl)-1H-[1]benzopyrano[3,4-f]quinoline

5 The C-5 lactol-9-*tert*-butyldimethylsilyl ether of core 7 and *iso*-butylmagnesium chloride were processed as in example 251 to provide the desired compound:

¹H NMR (300 MHz, DMSO-d₆) □ 8.69 (s, 1H), 7.90 (d, J=8 Hz, 1H), 6.61 (d, J=8 Hz, 1H), 6.59 (d, J=8 Hz, 1H), 6.48 (d, J=8 Hz, 1H), 6.16 (br s, 1H), 5.71 (m, 1H), 5.44 (br s, 1H), 3.63 (s, 3H), 2.17 (s, 3H), 1.82-1.60 (m, 2H), 1.43-1.18 (m, 1H), 1.17 (s, 3H), 1.16 (s, 3H), 0.97 (d, J=7 Hz, 3H), 0.76 (d, J=7 Hz, 3H); ¹³C NMR (75 MHz, DMSO-d₆) □ 145.8, 144.8, 143.8, 143.0, 133.5, 133.3, 127.5, 126.4, 117.9, 116.3, 116.1, 114.2, 113.4, 112.1, 71.8, 59.3, 49.6, 29.1, 28.9, 24.6, 24.0, 23.3, 21.2; MS (FAB Hi Res) *m/e* calc'd for C₂₄H₂₉NO₃: 379.2147. Found 379.2159.

Example 2602,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-fluoro-4-chlorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

15 The C-5 lactol-9-*tert*-butyldimethylsilyl ether of core 7 and 3-fluoro-4-chlorophenyl magnesium bromide were processed according to Example 251 to provide the desired compound.

20 ¹H NMR (300 MHz, DMSO-d₆) □ 8.72 (s, 1H), 7.91 (d, J=8 Hz, 1H), 6.59 (d, J=8 Hz, 1H), 6.59 6.48 (d, J=8 Hz, 1H), 6.16 (br s, 1H), 5.71 (m, 1H), 5.44 (br s, 1H), 3.63 (s, 3H), 2.17 (s, 3H), 1.82-1.60 (m, 2H), 1.43-1.18 (m, 1H), 1.17 (s, 3H), 1.16 (s, 3H), 0.97 (d, J=7 Hz, 3H), 0.76 (d, J=7 Hz, 3H).

Example 261 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-butenyl)-1H-[1]benzopyrano[3,4-f]quinoline

25 The C-5 lactol-9-*tert*-butyldimethylsilyl ether of core 7 and 1-butenyl-4-magnesium bromide were processed according to Example 251 to provide the desired compound.

Example 262 2,5-dihydro-9-hydroxy-10-methoxy-5-(phenylmethyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

30 The C-5 lactol-9-TBS ether of core 7 and benzylmagnesium bromide were processed as in example 251 to provide the desired compound:

¹H NMR (300 MHz, DMSO-d₆) □ 8.77 (s, 1H), 7.97 (d, J=9 Hz, 1H), 7.34-7.13 (m, 3H), 7.11 (s, 1H), 7.10 (d, J=7 Hz, 1H), 6.67 (m, J=8 Hz, 1H), 6.65 (m, J=8 Hz, 1H), 6.42 (d, J=9 Hz, 1H), 6.20 (br s, 1H), 5.86 (dd, J=10, 3 Hz, 1H), 5.42 (br s, 1H), 3.69 (s, 3H),

2.99 (dd, J=10, 14 Hz, 1H), 2.77 (dd, J=3, 15 Hz, 1H); 2.23 (s, 3H), 1.16 (s, 3H), 1.15 (s, 3H); ¹³C NMR (125 MHz, DMSO-d₆) □ 145.8, 145.0, 144.0, 142.8, 138.0, 133.3, 132.4, 128.9 (2C), 121.1 (2C), 127.4, 126.4, 126.1, 117.9, 116.3, 116.2, 114.4, 113.7, 112.5, 74.5, 59.4, 49.7, 37.9, 29.2, 29.0, 24.3; MS (DCI/NH₃) *m/e* (M+H)⁺ 414; Anal. calcd for C₂₇H₂₇NO₃•1/4H₂O: C, 77.58; H, 6.63; N, 3.35. Found: C, 77.70; H, 7.07; N, 3.19.

Example 263 (-) (5S,3'R) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-[1-ethyl-3-cyclohexenyl]-1H-[1]benzopyrano[3,4-f]quinoline

The mixture of diastereomers from example 277 were resolved on a Chiracel OJ HPLC column eluting with hexane:2-propanol (95:5) to give the desired product. ¹H NMR (300 MHz, DMSO-d₆) □ 8.67 (s, 1H), 7.99 (d, J=9 Hz, 1H), 6.65 (d, J=9 Hz, 1H), 6.62 (d, J=9 Hz, 1H), 6.53 (d, J=8 Hz, 1H), 6.22 (s, 1H), 5.44 (d, J=12 Hz, 2H), 5.30 (d, J=10 Hz, 1H), 3.62 (s, 3H), 3.50-2.26 (m, 1H), 2.11 (s, 3H), 1.89-1.72 (m, 3H), 1.25-1.17 (m, 2H), 1.03 (2, 3H), .088 (t, J=7 Hz, 3H); ¹³C NMR (75 MHz, DMSO-d₆) □ 145.4, 144.9, 144.0, 143.7, 140.1, 133.6, 130.9, 127.9, 126.1, 120.0, 118.2, 117.8, 116.6, 114.3, 113.3, 112.0, 76.2, 59.3, 49.4, 37.7, 30.2, 29.6, 27.7, 27.2, 24.9, 23.7, 21.6, 12.3.

Example 264 (-) (S) 5-cyclopentyl-2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 and cyclopentylmagnesium chloride were processed as in Example 25₁. The resulting racemic product was resolved into its constituent enantiomers by HPLC on a (R, R)-WHELK-O₁ column eluting with 2%

EtOH in hexanes to give the desired compound as the first eluent:

¹H NMR (300 MHz, DMSO-d₆) □ 8.66 (s, 1H), 8.00 (d8, 1H), 6.63 (d8, 1H), 6.61 (d, J=8 Hz, 1H), 6.48 (d, J=8 Hz, 1H), 6.24 (br s, 1H), 5.45 (br s, 1H), 5.35 (d, J=10 Hz, 1H), 3.65 (s, 3H), 2.15 (s, 3H), 2.12-1.97 (m, 1H), 1.60-1.43 (m, 4H), 1.42-1.22 (m, 2H), 1.19-1.07 (m, 2H), 1.31 (s, 3H), 1.02 (s, 3H); MS (DCI/NH₃) *m/e* (M+H)⁺ 392.

Example 265 (+) (R) 5-cyclopentyl-2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

The racemic product from Example 264 was resolved into its constituent enantiomers by HPLC on a (R, R)-WHELK-O₁ column eluting with 2% EtOH in hexanes to give the desired compound as the second eluent:

¹H NMR (300 MHz, DMSO-d₆) □ 8.66 (s, 1H), 8.00 (d8, 1H), 6.63 (d8, 1H), 6.61 (d, J=8 Hz, 1H), 6.48 (d, J=8 Hz, 1H), 6.24 (br s, 1H), 5.45 (br s, 1H), 5.35 (d, J=10 Hz, 1H), 3.65 (s, 3H), 2.15 (s, 3H), 2.12-1.97 (m, 1H), 1.60-1.43 (m, 4H), 1.42-1.22 (m, 2H), 1.19-1.07 (m, 2H), 1.31 (s, 3H), 1.02 (s, 3H); MS (DCI/NH₃) *m/e* (M+H)⁺ 392.

Example 266 2,5-dihydro-9-hydroxy-10-methoxy-5-(3-propynyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 and propargylmagnesium bromide (Gaoni, Y.; Leznoff, C.C.; Sondheimer. *J. Am. Chem. Soc.* **1968**, 90, 4940-4945.) were processed as in Example 251 to give the desired compound. ¹H NMR (300 MHz, DMSO-d₆) δ 8.77 (s, 1H), 7.92 (d, J=9 Hz, 1H), 6.63 (dd, J=9, 8 Hz, 2H), 6.54 (m, 1H), 6.17 (s, 1H), 5.82 (dd, J=9, 9 Hz, 1H), 5.44 (s, 1H), 3.68 (s, 3H), 2.78 (t, 1H), 2.44-2.36 (m, 2H), 2.18 (s, 3H), 1.17 (d, J=5 Hz, 6H); ¹³C NMR (75 MHz, DMSO-d₆) δ 145.9, 145.5, 145.4, 145.2, 143.9, 142.3, 133.5, 132.6, 131.4, 127.4, 126.5, 117.4, 116.5, 115.8, 114.5, 114.0, 112.6, 91.4, 80.7, 72.5, 59.4, 49.8, 29.3, 29.0, 23.9, 23.3, 22.4.

Example 267 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-propyl)-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 and *iso*-propylmagnesium chloride were processed as in Example 251 to provide the desired compound. ¹H NMR (300 MHz, DMSO-d₆) δ 8.65 (s, 1H), 7.99 (d, J=8 Hz, 1H), 6.64 (d, J=8 Hz, 1H), 6.61 (d, J=8 Hz, 1H), 6.51 (d, J=8 Hz, 1H), 6.22 (br s, 1H), 5.44 (br s, 1H), 5.26 (d, J=10 Hz, 1H), 3.64 (s, 3H), 2.16 (s, 3H), 1.85-1.67 (m, 1H), 1.30 (s, 3H), 1.02 (s, 3H), 0.93 (d, J=6 Hz, 3H), 0.64 (t, 3H); ¹³C NMR (75 MHz, DMSO-d₆) δ 145.3, 144.8, 144.0, 143.7, 133.5, 131.6, 128.2, 126.1, 118.4, 117.9, 116.5, 114.3, 113.2, 112.0, 77.7, 59.3, 49.4, 30.7, 29.7, 27.2, 23.9, 19.5, 17.9; MS (DCI/NH₃) *m/e* (M+H)⁺ 366; Anal. calcd for C₂₃H₂₇NO₃•1/4H₂O: C, 74.67; H, 7.49; N, 3.79. Found: C, 74.81; H, 7.39; N, 3.67.

Example 268

2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(5-methoxy-2-thienyl)-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 and 2-methoxythiophene were processed according to Example 276 to provide the desired compound. ¹H NMR (300 MHz, DMSO-d₆) δ 8.63 (s, 1H), 7.93 (d, J=8 Hz, 1H), 6.70 (d, J=8 Hz, 1H), 6.65 (s, 1H), 6.50 (d, J=8 Hz, 1H), 6.39 (d, J=9 Hz, 1H), 6.28 (d, J=3 Hz, 1H), 6.23 (br s, 1H), 5.97 (d, J=3 Hz, 1H), 5.38 (br s, 1H), 3.72 (s, 3H), 3.59 (s, 3H), 1.97 (s, 3H), 1.22 (s, 3H), 1.13 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) δ 166.2, 145.7, 145.1, 143.6, 143.5, 132.9, 130.2, 128.7, 127.6, 126.4, 126.0, 118.3, 117.2, 117.2, 114.2, 112.4, 102.7, 71.5, 59.7, 59.1, 49.8, 29.8, 28.6, 22.9; MS (DCI/NH₃) *m/e* (M+H)⁺ 436; Anal. calcd for C₂₅H₂₅NO₄S•1/4H₂O: C, 68.24; H, 5.84; N, 3.18. Found: C, 68.52; H, 6.19; N, 3.00.

Example 269 ($\pm$) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2,3,4,5,6-pentafluorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 and pentafluorophenylmagnesium bromide were processed to give the desired compound which was purified by flash chromatography eluting with 4:1 hexane/EtOAc.

MS (DCI/NH₃) m/z 490 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.75 (s, 1H), 7.83 (d, 1H), 6.82 (s, 1H), 6.67 (d, 1H), 6.44 (d, 1H), 6.33 (d, 1H), 6.19 (s, 1H), 5.37 (s, 1H), 3.53 (s, 3H), 1.77 (s, 3H), 1.17 (s, 3H), 1.06 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) δ 146.1, 145.8, 143.8, 142.9, 133.4, 128.4, 127.0, 126.2, 118.6, 118.1, 117.6, 114.5, 114.2, 113.3, 112.2, 105.0, 68.6, 58.9, 49.9, 29.8, 28.3, 23.1;

Anal. calcd for C₂₆H₂₀NO₃F₅ • 0.5 H₂O: C, 62.65; H, 4.25; N, 2.81. Found: C, 62.4; H, 4.28; N, 2.73.

Example 270 (+/-) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5(S)-(3(S)-1-hydroxymethylcyclopenten-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 420(M+H)⁺;

¹H NMR (400 MHz, DMSO-d₆) ¹H NMR (200 MHz, DMSO-d₆) δ 8.77 (s, 1H), 8.04 (d, 1H), 6.67 (d, 1H), 6.62 (d, 1H), 6.52 (d, 1H), 6.24 (bs, 1H), 6.12 (dd, 1H), 5.50 (d, 1H), 5.42 (bs, 1H), 2.64 (s, 2H), 2.57 (s, 2H), 2.75-1.09 (m, 14H).

Example 271 (+/-) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5(S)-(3(S)-1-methylcarboxylatecyclopenten-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 and 3-cyclohexenyl trimethylsilane were processed as above to give a 3:2 diastereomeric product mixture which was subjected to HPLC on an (R,R) WHELK-O 1 column eluting with 2% EtOH in hexanes to provide the individual enantiomers.

Example 272 (-) (5S,3'S) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclohexenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 404 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.70 (s, 1H), 7.99 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.52 (d, 1H), 6.20 (d, 1H), 5.61 (ddd, 1H), 5.46 (d, 1H), 5.41 (s, 1H), 5.10 (dd, 1H), 3.66 (s, 3H), 2.27 (m, 1H), 2.10 (s, 3H), 1.99-1.72 (m, 2H), 1.70-1.55 (m, 3H), 1.35 (m, 1H), 1.29 (s, 3H), 1.06 (s, 3H);

^{13}C NMR (400 MHz, DMSO- d_6) $\square$ 145.4, 145.0, 143.4, 143.0, 133.5, 131.0, 128.9, 128.1, 126.4, 126.3, 117.9, 116.5, 114.4, 113.5, 112.1, 75.2, 59.3, 49.5, 36.9, 29.7, 27.6, 25.5, 24.6, 24.3, 20.0;
[$\square$] $^{23}\text{D} = -162^\circ$ (c 0.11, CHCl_3).

5

Example 273 (-) (5S,3'R) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclohexenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/ NH_3) m/z 404 ($\text{M}+\text{H}$) $^+$;

^1H NMR (300 MHz, DMSO- d_6) $\square$ 8.70 (s, 1H), 8.01 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.53 (d, 1H), 6.27 (d, 1H), 5.82-5.65 (m, 2H), 5.45 (s, 1H), 5.33 (d, 1H), 3.65 (s, 3H), 2.28 (m, 1H), 2.12 (s, 3H), 1.86 (m, 2H), 1.55 (m, 1H), 1.31 (s, 3H), 1.26-1.14 (m, 3H), 1.03 (s, 3H);

^{13}C NMR (400 MHz, DMSO- d_6) $\square$ 145.4, 145.0, 144.1, 143.5, 133.6, 130.7, 128.1, 127.9, 127.7, 126.1, 118.4, 117.8, 116.5, 114.4, 113.4, 112.1, 75.9, 59.3, 49.4, 37.2, 29.6, 27.1, 24.7, 24.6, 23.7, 21.2;
[$\square$] $^{23}\text{D} = -158^\circ$ (c 0.50, CHCl_3).

15

Example 274 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-thienyl)-1H-[1]benzopyrano[3,4-f]quinoline

20

A 0.24 M solution of 2-thienylzinc chloride was prepared by diluting 2-thienyl lithium (1.0 ml of a 1M/THF solution, 1.0 mmol) with ethyl ether (2 ml), cooling to 0°C ; treating with ZnCl_2 (1.1 ml of a 1M/ Et_2O solution, 1.10 mmol), and allowing to come to room temperature. The resulting heterogeneous mixture was stirred vigorously.

25

The C-5 lactol-9-TBS ether of core 7 and the 2-thienylzinc chloride from above were processed according to Example 251 to provide the desired compound:

^1H NMR (300 MHz, DMSO- d_6) $\square$ 8.65 (s, 1H), 7.95 (d, $J=9$ Hz, 1H), 7.39 (dd, $J=5$, 1 Hz, 1H), 6.85-6.82 (m, 2H), 6.74 (m, 1H), 6.72 (d, $J=8$ Hz, 1H), 6.48 (d, $J=8$ Hz, 1H), 6.37 (d, $J=9$ Hz, 1H), 6.28 (br s, 1H), 5.39 (br s, 1H), 3.59 (s, 3H), 1.93 (s, 3H), 1.22 (s, 3H), 1.14 (s, 3H); ^{13}C NMR (75 MHz, DMSO- d_6) $\square$ 145.7, 145.1, 143.7, 143.6, 143.5, 133.0, 130.8, 127.9, 127.5, 127.0, 126.5, 126.4, 118.3, 117.1, 114.4, 114.2, 112.4, 70.9, 59.0, 49.8, 29.7, 28.6, 23.0; MS (DCI/ NH_3) m/e ($\text{M}+\text{H}$) $^+$ 406; Anal. calcd for $\text{C}_{24}\text{H}_{23}\text{NO}_3\text{S}$: C, 71.09; H, 5.72; N, 3.45. Found: C, 70.93; H, 6.00; N, 3.27.

30

Example 275 ($\pm$) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-methylphenyl)-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 and o-tolylmagnesium bromide were processed to give the desired product which was purified by flash chromatography eluting with 4:1 hexane/EtOAc.

MS (DCI/NH₃) m/z 414 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.43 (s, 1H), 7.79 (d, 1H), 7.02 (d, 1H), 6.92 (dt, 1H), 6.72 (t, 1H), 6.59 (d, 1H), 6.55 (s, 1H), 6.54 (d, 1H), 6.24 (d, 1H), 6.12 (d, 1H), 6.07 (s,

1H), 5.20 (s, 1H), 3.48 (s, 3H), 2.44 (s, 3H), 1.54 (s, 3H), 1.09 (s, 3H), 0.98 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) δ 145.9, 145.0, 143.9, 143.6, 137.5, 136.6, 132.6,

130.6, 130.5, 128.8, 128.1, 127.6, 126.4, 124.9, 118.7, 118.2, 117.8, 114.1, 114.0, 111.7,

73.7, 59.2, 49.8, 30.0, 28.3, 22.5, 19.3;

Anal. calcd for C₂₇H₂₇NO₃: C, 78.42; H, 6.58; N, 3.39. Found: C, 78.07; H, 6.85; N,

3.09.

Example 276 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-acetoxymethyl-3-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

The C-5 lactol-9-TBS ether of core 7 (0.150 g, 0.321 mmol) was dissolved in dichloromethane (15 ml), treated with 2-[(trimethylsilyl)methyl]-2-propene-1-yl acetate (0.180 g, 0.962 mmol), cooled to -78°C, treated dropwise with BF₃•Et₂O and allowed to warm to 0°C. After 10 minutes, the reaction mixture was partitioned between saturated aqueous bicarbonate and ethyl acetate, layers separated, aqueous layer extracted with ethyl acetate, the combined organics washed with brine, dried (MgSO₄) and concentrated.

The resulting yellow oil was dissolved in THF (10 ml), cooled to 0°C, and treated with tetrabutylammonium fluoride solution (0.35 ml of a 1M / THF solution, 0.35 mmol). After 10 minutes, the mixture was quenched by the addition of saturated aqueous ammonium chloride and pH 7.0 buffer, and the layers were separated. The aqueous layer was extracted with ethyl acetate, the combined organics washed with brine, dried (MgSO₄), and concentrated. The residue was purified by silica gel chromatography eluting with 25% ethyl acetate in hexanes to provide 0.125 g (89%) of the desired compound.

¹H NMR (300 MHz, DMSO-d₆) δ 8.74 (s, 1H), 7.92 (d, J=8 Hz, 1H), 6.63 (d, J=8 Hz, 1H), 6.62 (d, J=8 Hz, 1H), 6.41 (d, J=9 Hz, 1H), 6.21 (br s, 1H), 5.85 (dd, J=2, 10 Hz, 1H), 5.44 (s, 1H), 5.08 (s, 1H), 4.92 (s, 1H), 4.58 (ABq, J=13, 30 Hz, 2H), 3.65 (s, 3H), 2.23 (m, 2H), 2.17 (s, 3H), 1.99 (s, 3H), 1.18 (s, 3H), 1.15 (s, 3H); MS (DCI/NH₃) m/e

(M+H)⁺ 436; Anal. calcd for C₂₆H₂₉NO₅: C, 71.71; H, 6.71; N, 3.22. Found: C, 71.34; H, 6.98; N, 3.12.

Example 277 (+) (5R,3'S) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-[1-ethyl-3-cyclohexenyl]-1H-[1]benzopyrano[3,4-f]quinoline

To 77 ml of a 0.36 M THF solution of dimethylphenylsilyl methyl cuprate (27.7 mmol) (Fleming, I.; Newton, T. W. *J. Chem. Soc. Perkin Trans. I*, **1984**, 1805.) at -23°C was added 3-ethyl-cyclohex-2-ene-1-one (2.73 g, 27.0 mmol). The mixture was stirred for 1 hr at -23 °C, then for 2 hr at 0°C; treated with N-phenyl-bis-(trifluoromethanesulfonimide) (4.43 g, 26.4 mmol), allowed to warm to room temperature and stirred for 18 hr. The reaction mixture was quenched with saturated aqueous sodium bicarbonate, filtered through celite, and the layers were separated. The organic layer was washed with saturated aqueous sodium bicarbonate, brine, and dried (Na₂SO₄). The product was purified by silica gel column chromatography eluting with hexanes to give the intermediate triflate as a light yellow oil.

The above triflate (0.70 g, 1.28 mmol) was combined with tributyltin hydride (0.92 g, 2.13 mmol) in THF and added dropwise to a THF solution of tetrakis(triphenylphosphine)palladium(0) (0.44 g, 3.5 mmol) and LiCl (0.45 g, 10.7 mmol) at room temperature. After the addition, the reaction was refluxed for 24 hr, cooled, filtered through a pad of celite, and stirred vigorously with saturated potassium fluoride solution for 2 hours. The mixture was filtered through celite, diluted with ethyl acetate, and the layers were separated. The organic layer was washed with saturated aqueous sodium bicarbonate, brine, and dried (Na₂SO₄). The product was purified by silica gel column chromatography eluting with hexanes to give 3-ethyl-3-dimethylphenylsilyl-cyclohexene as a colorless oil.

The C-5 lactol-9-TBS ether of core 7 and 3-ethyl-3-dimethylphenylsilyl-cyclohexene were processed according to example 276 to give the product as a mixture of diastereomers that was separated on a (R,R)-Whelk-O1 HPLC column eluting with hexane:ethanol (98:2) to give the desired compound. : ¹H NMR (500 MHz, DMSO-d₆) δ 8.01 (d, J=8 Hz, 1H), 6.63 (d, J=8 Hz, 1H), 6.61 (d, J=9 Hz, 1H), 6.53 (d, J=9 Hz, 1H), 6.20 (s, 1H), 5.48 (s, 1H), 5.44 (s, 1H), 5.32 (d, J=9 Hz, 1H), 3.64 (s, 3H), 2.26 (m, 1H), 1.90-1.73 (m, 3H), 1.60 (m, 1H), 1.26-1.18 (m, 2H), 1.03 (s, 3H), .088 (t, J=7 Hz, 3H); ¹³C NMR (50 MHz, DMSO-d₆) δ 145.3, 144.8, 144.0, 143.6, 140.3, 133.5, 130.8, 127.8, 126.0, 120.0, 118.1, 117.8, 116.5, 114.2, 113.2, 111.9, 76.1, 59.2, 49.4, 37.5, 30.1, 29.5, 27.7, 27.1, 24.8, 23.6, 21.6, 12.2; MS m/e calc'd for C₂₈H₃₃O₃N: 431.2460. Found 431.2467.

The C-5 lactol-9-TBS-ether of core 7 and cyclohexylmagnesium chloride were processed to give a mixture of Examples 278 and 279 which were separated by flash chromatography eluting with 4:1 hexane/EtOAc.

5 Example 278 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-cyclohexyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 406 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 8.66 (s, 1H), 7.96 (d, 1H), 6.61 (d, 1H), 6.59 (d, 1H), 6.47 (d, 1H), 6.18 (d, 1H), 5.42 (s, 1H), 5.30 (d, 1H), 3.64 (s, 3H), 2.13 (s, 3H), 1.87 (m, 1H), 1.60-1.48 (m, 3H), 1.28 (s, 3H), 1.20-0.80 (m, 7H), 1.00 (s, 3H);
10 ¹³C NMR (400 MHz, DMSO-d₆) □ 145.3, 144.8, 144.1, 143.8, 133.5, 131.1, 128.1, 126.1, 118.5, 117.9, 116.6, 114.4, 113.2, 112.0, 76.8, 59.3, 49.4, 29.7, 29.5, 28.0, 27.2, 25.8, 25.6, 25.3, 23.8;

15 Example 279 2,5,5-trihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 324 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 8.78 (s, 1H), 7.81 (d, 1H), 6.62 (d, 1H), 6.57 (d, 1H), 6.53 (d, 1H), 6.22 (s, 1H), 5.40 (s, 1H), 5.05 (s, 2H), 3.62 (s, 3H), 2.01 (s, 3H), 1.19 (s, 6H);
20 ¹³C NMR (400 MHz, DMSO-d₆) □ 146.6, 145.4, 145.3, 144.0, 131.5, 130.8, 128.1, 126.2, 118.2, 118.0, 117.2, 113.9, 113.2, 111.2, 67.1, 59.4, 49.9, 29.0, 22.9;

25 Example 280 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-hydroxymethyl-3-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

Example 276 (0.032g, 0.074 mmol) was dissolved in THF/MeOH/H₂O (5ml/1ml/0.5ml), cooled to 0°C, treated with K₂CO₃ (0.051 g, 0.367 mmol), and allowed to warm to room temperature and stir for 12 h. The mixture was partitioned between saturated aqueous ammonium chloride and ethyl acetate, the aqueous layer extracted with ethyl acetate, the combined organics washed with brine, dried (MgSO₄), and concentrated. The residue was purified by silica gel chromatography eluting with 25% then 50% ethyl acetate in hexanes to give 0.022 g (76%) of the desired compound.
30 ¹H NMR (300 MHz, DMSO-d₆) □ 8.71 (s, 1H), 7.92 (s, J=9 Hz, 1H), 6.62 (d, J=9 Hz, 1H), 6.61 (d, J=8 Hz, 1H), 6.41 (d, J=8 Hz, 1H), 6.18 (d, J=1 Hz, 1H), 5.86 (dd, J=11, 1 Hz, 1H), 5.43 (br s, 1H), 5.02 (m, 1H), 4.80 (t, J=6 Hz, 1H), 4.74 (br s, 1H), 3.90-3.78 (m, 2H), 3.65 (s, 3H), 2.50-2.36 (m, 1H), 2.23-2.10 (m, 1H), 2.19 (s, 3H), 1.17 (s, 3H), 1.16 (s, 3H); ¹³C NMR (125 MHz, DMSO-d₆) □ 145.9, 145.8, 144.9, 143.8, 142.8,
35

133.2, 132.8, 127.6, 126.4, 117.7, 116.2, 116.2, 114.2, 113.6, 112.6, 110.6, 72.1, 63.7, 59.4, 49.7, 35.4, 29.2, 28.9, 23.9; MS (DCI/NH₃) *m/e* (M+H)⁺ 394.

Example 281 methyl 2-[2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]-5-quinolinyll acetate

The C-5 lactol-9-TBS ether of core 7 was processed as in example 46 to provide the intermediate silylated product.

¹H NMR (300 MHz, DMSO-d₆) □ 7.94 (d, J=9 Hz, 1H), 6.64 (dd, J=9, 3 Hz, 1H), 6.49 (d, J=9 Hz, 1H), 6.27 (s, 1H), 6.14 (dd, J=10, 3 Hz, 1H), 4.45 (s, 1H), 3.63 (s, 3H), 3.61 (s, 3H), 2.76-2.55 (m, 2H), 2.20 (s, 3H), 1.18 (s, 3H), 1.16 (s, 3H), 1.00 (s, 9H), 0.21 (s, 3H), 0.16 (s, 3H); MS (APCI) *m/e* (M+H)⁺ 510, (M-H)⁻ 508.

The intermediate silylated compound above (0.030 g, 0.058) was dissolved THF (1 ml) cooled to 0°C, and treated with tetrabutylammonium fluoride (58 μL of a 1M/THF solution, 0.058 mmol). After 5 minutes, the mixture was poured over saturated aqueous NH₄Cl and extracted with ethyl acetate. The combined organic layers were washed with brine and dried (MgSO₄). The product was purified by silica gel chromatography eluting with 40% methyl *t*-butyl ether in hexane to provide the desired compound (0.019 g, 82%) as a white solid. ¹H NMR (300 MHz, DMSO-d₆) □ 8.80 (s, 1H), 7.93 (d, J=9 Hz, 1H), 6.64 (d, J=9 Hz, 1H), 6.61 (d, J=9 Hz, 1H), 6.43 (d, J=9 Hz, 1H), 6.25 (s, 1H), 6.10 (dd, J=10, 3 Hz, 1H), 5.45 (s, 1H), 3.66 (s, 3H), 3.60 (s, 3H), 2.77-2.52 (m, 2H), 2.21 (s, 3H), 1.18 (s, 3H), 1.16 (s, 3H); MS (APCI) *m/e* (M+H)⁺ 396, (M-H)⁻ 394.

Example 282

(Z) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-butenyl)-1H-

[1]benzopyrano[3,4-f]quinoline

The intermediate silylated product from example 281 (0.445 g, 0.87 mmol) was dissolved in THF (4 ml), cooled to 0°C, treated dropwise with Dibal-H (2.69 mL of a 1M/THF solution, 2.69 mmol), and stirred for 30 minutes. The reaction mixture was poured over a rapidly stirring mixture of 100 mL of saturated aqueous potassium sodium tartrate and 100 mL of ethyl acetate and stirred for 1 hour. The layers were separated, the aqueous layer extracted with ethyl acetate, the combined organic layers washed with saturated aqueous sodium bicarbonate, brine and dried (MgSO₄). The residue was purified by silica gel chromatography eluting with 20% then 30% methyl *t*-butyl ether in hexane followed by 6% ethyl acetate in dichloromethane to give the primary alcohol (0.293 g, 70%) as a white solid. ¹H NMR (300 MHz, DMSO-d₆) □ 7.92 (d, J=9 Hz, 1H), 6.65 (d, J=9 Hz, 1H), 6.61 (d, J=9 Hz, 1H), 6.57 (d, J=9 Hz, 1H), 6.21 (s, 1H), 5.88 (dd, J=10, 3 Hz, 1H), 5.43 (s, 1H), 4.62 (t, J=5 Hz, 1H), 3.61 (s, 3H), 2.19 (s, 3H), 1.90-1.75

(m, 2H), 1.62-1.47 (m, 2H), 1.17 (s, 3H), 1.15 (s, 3H), 0.99 (s, 9H), 0.20 (s, 3H), 0.15 (s, 3H); MS (APCI) m/e : (M+H)⁺ 482, (M-H)⁻ 480.

A stirring solution of oxalyl chloride (22 μ L, 0.249 mmol) in THF (2 mL) was cooled to -78°C, treated with DMSO (24 μ L, 0.332 mmol), stirred for 5 minutes and treated dropwise with a solution of the above primary alcohol (0.080 g, 0.166 mmol) in 2 mL of THF. The resulting mixture was stirred for 40 minutes, treated with triethylamine (92.5 μ L, 0.664 mmol) stirred a further 10 minutes and allowed to warm to 0°C. After 30 minutes at 0°C the reaction mixture was partitioned between water and dichloromethane, the aqueous layer extracted with dichloromethane, and the combined organic layers dried (MgSO₄). The product was purified by silica gel chromatography eluting with 20% then 30% ethyl acetate in hexane to give the aldehyde (0.059 g, 73%) as a white solid. ¹H NMR (300 MHz, DMSO-d₆) δ 9.65 (s, 1H), 7.93 (d, J=9 Hz, 1H), 6.67 (d, J=9 Hz, 1H), 6.65 (d, J=9 Hz, 1H), 6.48 (d, J=9 Hz, 1H), 6.33 (m, 2H), 5.46 (s, 1H), 3.63 (s, 3H), 2.87 (m, 1H), 2.65 (m, 1H), 2.18 (s, 3H), 1.19 (s, 3H), 1.14 (s, 3H), 1.00 (s, 9H), 0.21 (s, 3H), 0.15 (s, 3H); MS (APCI) m/e : (M+H)⁺ 480, (M-H)⁻ 478.

A solution of ethyltriphenylphosphonium bromide (0.130 g, 0.351 mmol) in THF:Et₂O (3 ml, 3:2) was cooled to 0°C and treated dropwise with *n*-BuLi (140 μ L of a 2.5 M/hexanes, 0.351 mmol). The resulting deep red solution was stirred for 30 minutes at 0°C, cooled to -78°C and treated with the above aldehyde (0.056 g, 0.117 mmol) in THF (2 mL). The reaction mixture was stirred for 5 minutes at -78°C, warmed to 0°C for 40 minutes and quenched by the addition of water. The layers were separated, the aqueous layer extracted with dichloromethane, the combined organic layers washed with brine and dried (MgSO₄). The product was purified by silica gel chromatography eluting with a gradient from 5% to 20% ethyl acetate in hexane to provide the intermediate silyl ether (0.050 g, 87%) as a white solid. ¹H NMR (300 MHz, DMSO-d₆) δ 7.92 (d, J=9 Hz, 1H), 6.65 (d, J=9 Hz, 1H), 6.63 (d, J=9 Hz, 1H), 6.20 (s, 1H), 5.68 (dd, J=10, 3 Hz, 1H), 5.43 (m, 3H), 3.64 (s, 3H), 2.15 (s, 3H), 1.26 (d, J=5 Hz, 3H), 1.17 (s, 6H), 1.00 (s, 9H), 0.20 (s, 3H), 0.15 (s, 3H); MS (APCI) m/e : (M+H)⁺ 492, (M-H)⁻ 490.

The intermediate silyl ether (0.038 g, 0.077 mmol) was dissolved in THF (3 ml), cooled to 0°C, treated with tetrabutylammonium fluoride (80 ml of a 1 M/THF solution, 0.080 mmol), and the mixture was partitioned between ethyl acetate and saturated ammonium chloride. The aqueous layer was extracted with ethyl acetate, the combined organics were washed with brine, dried (MgSO₄) and purified by silica gel chromatography eluting with 25 % ethyl acetate in hexanes to give the desired compound (0.024 g, 83%). ¹H NMR (300 MHz, DMSO-d₆) δ 8.71 (s, 1H), 7.93 (d, J=9 Hz, 1H), 6.62 (d, J=9 Hz, 1H), 6.60 (d, J=9 Hz, 1H), 6.47 (d, J=9 Hz, 1H), 6.18 (s, 1H), 5.62 (dd, J=10, 3 Hz, 1H), 5.43 (m, 3H), 3.64 (s, 3H), 2.45-2.18 (m, 2H), 2.15 (s, 3H),

1.30 (d, J=5 Hz, 3H), 1.15 (s, 6H); MS (APCI) m/e calc'd for : 377.20. Found ; (M+H)⁺ 378, (M-H)⁻ 376.

Example 283

2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-methyl-2-butenyl)-1H-[1]benzopyrano[3,4-f]quinoline

The intermediate aldehyde from Example 282 and isopropyltriphenylphosphonium iodide were processed according to Example 282 to give the desired compound. ¹H NMR (300 MHz, DMSO-d₆) δ 8.65 (s, 1H), 7.91 (d, J=9 Hz, 1H), 6.62 (d, J=9 Hz, 1H), 6.60 (d, J=9 Hz, 1H), 6.46 (d, J=9 Hz, 1H), 6.14 (s, 1H), 5.60 (dd, J=9, 3 Hz, 1H), 5.43 (s, 1H), 5.15 (m, 1H), 3.64 (s, 3H), 2.45-2.18 (m, 2H), 2.15 (s, 3H), 1.63 (s, 3H), 1.32 (s, 3H), 1.17 (s, 3H), 1.16 (s, 3H); MS (APCI) m/e (M+H)⁺ 392, (M-H)⁻ 390.

Example 284 (+) (5S,3'S) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclohexenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 404 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.70 (s, 1H), 8.01 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.53 (d, 1H), 6.27 (d, 1H), 5.82-5.65 (m, 2H), 5.45 (s, 1H), 5.33 (d, 1H), 3.65 (s, 3H), 2.28 (m, 1H), 2.12 (s, 3H), 1.86 (m, 2H), 1.55 (m, 1H), 1.31 (s, 3H), 1.26-1.14 (m, 3H), 1.03 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) δ 145.4, 145.0, 144.1, 143.5, 133.6, 130.7, 128.1, 127.9, 127.7, 126.1, 118.4, 117.8, 116.5, 114.4, 113.4, 112.1, 75.9, 59.3, 49.4, 37.2, 29.6, 27.1, 24.7, 24.6, 23.7, 21.2;

$[\alpha]_D^{23} = +184^\circ$ (c 0.33, CHCl₃).

Example 285 (+) (5R,3'R) 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclohexenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 404 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.70 (s, 1H), 7.99 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.52 (d, 1H), 6.20 (d, 1H), 5.61 (ddd, 1H), 5.46 (d, 1H), 5.41 (s, 1H), 5.10 (dd, 1H), 3.66 (s, 3H), 2.27 (m, 1H), 2.10 (s, 3H), 1.99-1.72 (m, 2H), 1.70-1.55 (m, 3H), 1.35 (m, 1H), 1.29 (s, 3H), 1.06 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) δ 145.4, 145.0, 143.4, 143.0, 133.5, 131.0, 128.9, 128.1, 126.4, 126.3, 117.9, 116.5, 114.4, 113.5, 112.1, 75.2, 59.3, 49.5, 36.9, 29.7, 27.6, 25.5, 24.6, 24.3, 20.0;

$[\alpha]_D^{23} = +170^\circ$ (c 0.23, CHCl₃).

Example 286 (+) (5R,3'S)-2,5(R)-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclopentenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 390 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 8.67 (s, 1H), 8.02 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.53 (d, 1H), 6.25 (s, 1H), 5.77 (ddd, 1H), 5.69 (ddd, 1H), 5.47 (s, 1H), 5.37 (s, 1H), 3.66 (s, 3H), 2.90 (m, 1H), 2.34-2.13 (m, 2H), 2.10 (s, 3H), 1.55-1.41 (m, 2H), 1.31 (s, 3H), 1.04 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) □ 145.5, 144.9, 144.0, 143.9, 133.6, 132.0, 131.7,

131.5, 127.9, 126.2, 117.7, 117.6, 116.5, 114.4, 113.3, 111.9, 76.1, 59.3, 49.4, 48.6, 31.7, 29.5, 27.1, 24.6, 23.7;

[□]²³D=+136° (c 0.355, CHCl₃).

Example 287 (+) (5R,3'R) 2,5(R)-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-cyclopentenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 390 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 8.68 (s, 1H), 8.01 (d, 1H), 6.65 (d, 1H), 6.62 (d, 1H), 6.51 (d, 1H), 6.22 (s, 1H), 5.72 (dd, 1H), 5.41 (d, 1H), 5.40 (s, 1H), 5.17 (dd, 1H), 3.63 (s, 3H), 2.90-2.80 (m, 1H), 2.41-2.32 (m, 1H), 2.23-2.10 (m, 1H), 2.06 (s, 3H), 1.89-1.71 (m, 2H), 1.30 (s, 3H), 1.08 (s, 3H);

¹³C NMR (400 MHz, DMSO-d₆) □ 145.5, 145.0, 143.9, 143.4, 133.5, 132.3, 132.2, 130.2, 128.1, 126.4, 117.8, 116.9, 116.4, 114.4, 113.4, 111.9, 75.7, 59.3, 49.5, 48.7, 31.6, 29.8, 27.6, 27.1, 24.2;

[□]²³D=+116° (c 0.800, CHCl₃).

Example 288 rel-(5S)-9-hydroxy-5-[(3R)-(1-methoxycarbonyl)cyclohexen-3-yl]-10-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 462 (M+H)⁺;

¹H NMR (200 MHz, DMSO-d₆) □ 8.81 (s, 1 H), 8.07 (d, J=8.5 Hz, 1 H), 6.72 (d, J=8.5 Hz, 1 H), 6.70 (d, J=8.5 Hz, 1 H), 6.60 (d, J=8.5 Hz, 1 H), 6.42-6.41 (m, 1 H), 6.21 (d, J=1.2 Hz), 5.57 (d, J=10.2 Hz, 1 H), 5.45 (s, 1 H), 2.71 (s, 2 H), 2.58 (s, 2 H), 2.56-2.48 (m, 2 H), 2.20-2.16 (m, 2 H), 2.08 (d, J=1.2 Hz), 1.80-1.40 (m, 4 H), 1.25 (s, 2 H), 1.18 (s, 2 H);

HRMS calcd for C₂₈H₂₁NO₅ is 461.2202. Found 461.2212.

Example 289 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(2-methyl-3-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

Example 276 (0.040 g, 0.092 mmol) and
 5 dichlorobis(triphenylphosphine)palladium(II) (0.006 g, 0.009 mmol) were dissolved in dioxane (5 ml), heated to 100 °C and treated with sodium borohydride (0.017 g, 0.460 mmol). The resulting black solution was allowed to cool to room temperature, diluted with water and ethyl acetate and filtered through celite. The layers were separated, the aqueous layer was extracted with ethyl acetate, the combined organics were washed with
 10 brine, dried (MgSO₄), and concentrated. Purification by silica gel chromatography eluting with 25% ethyl acetate in hexanes provided the desired product (0.028 g, 80%) as a colorless foam.

¹H NMR (300 MHz, DMSO-d₆) □ 8.71 (s, 1H), 7.92 (d, J=8 Hz, 1H), 6.62 (d, J=8 Hz, 1H), 6.61 (d, J=8 Hz, 1H), 6.41 (d, J=8 Hz, 1H), 6.18 (d, J=1 Hz, 1H), 5.83 (dd, J=3, 10
 15 Hz, 1H), 5.44 (br s, 1H), 4.75 (br s, 1H), 4.56 (br s, 1H), 3.65 (s, 3H), 2.50-2.41 (m, 1H), 2.19 (s, 3H), 2.16-2.07 (m, 1H), 1.73 (s, 3H), 1.18 (s, 3H), 1.15 (s, 3H); ¹³C NMR (125 MHz, DMSO-d₆) □ 145.8, 144.9, 143.8, 142.8, 141.6, 133.3, 132.7, 127.5, 126.4, 117.8, 116.3, 116.2, 114.2, 113.6, 112.8, 112.7, 72.0, 59.4, 49.7, 29.2, 28.8, 24.0, 22.4; MS (DCI/NH₃) *m/e* (M+H)⁺ 378; Anal. calcd for C₂₄H₂₇NO₃: C, 76.36; H, 7.21; N, 3.71.
 20 Found: C, 76.06; H, 7.17; N, 3.39.

Example 290 9,10-Dimethoxy-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (ESI) *m/z* 378 (M+H)⁺;

25 ¹H NMR (300 MHz, DMSO) □ 7.93 (d, J=8.5 Hz, 1 H), 6.82 (d, J=8.8 Hz, 1 H), 6.61 (dd, J=4.4, 4.4 Hz, 2 H), 6.22 (d, J=1.4 Hz, 1 H), 5.83 (ddt, J=16.9, 10.3, 3.1 Hz, 1 H), 5.70 (dd, J=10.3, 3.3 Hz, 1 H), 5.44 (s, 1 H), 5.44-4.96 (m, 2 H), 3.77 (s, 3 H), 3.67 (s, 3 H), 2.16 (s, 3 H), 1.17 (s, 3 H), 1.16 (s, 3 H);

HRMS calcd for C₂₄H₂₇NO₃ 377.1991. Found 377.2001.

Example 291 9,10-Dimethoxy-5-[3-cyclohexenyl]-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (ESI) *m/z* 418 (M+H)⁺;

35 ¹H NMR (300 MHz, DMSO), isomer 1: □ 8.02 (d, J=8.8 Hz, 1 H), 6.84 (d, J=1.7 Hz, 1 H), 6.70-6.60 (m, 2 H), 6.27 (d, J=0.6 Hz, 1 H), 5.80-5.60 (m, 2 H), 5.16-5.15 (m, 1 H), 3.77 (s, 3 H), 3.69 (s, 3 H), 2.13 (s, 3 H), 1.31 (s, 3 H), 1.07 (s, 3 H); isomer 2: □ 8.01 (d, J=8.81 Hz, 1 H), 6.80 (d, J=0.7 Hz, 1 H), 6.64 (m, 2 H), 6.26 (d, J=0.7 Hz, 1 H), 5.60-

5.30 (m, 2 H), 5.09 (s, 1 H), 3.77 (s, 3 H), 3.68 (s, 3 H), 2.10 (s, 3 H), 1.29 (s, 3 H), 1.04 (s, 3 H);

HRMS calcd for $C_{27}H_{31}NO_3$ 417.2304. Found 417.2299.

5 Example 292 10-methoxy-9-ethoxy-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-
[1]benzopyrano[3,4-f]quinoline

^1H NMR (300 MHz, DMSO) δ 7.94 (d, $J=8.8$ Hz, 1 H), 6.79 (d, $J=8.8$ Hz, 1 H), 6.60 (d, $J=8.8$ Hz, 1 H), 6.55 (d, $J=8.8$, 1 H), 6.45 (s, 1 H), 5.85 (ddt, $J=17.3$, 10.3, 6.6 Hz, 1 H), 5.43 (d, $J=9.2$ Hz), 5.16 (s, 1 H), 5.09 (dd, $J=10.3$, 1.1 Hz, 1 H), 5.06 (dd, $J=17.3$, 1.1 Hz, 1 H), 4.91 (s, 1 H), 4.06-3.97 (m, 2 H), 2.62-2.52 (m, 1 H), 2.31-2.15 (m, 1 H), 2.24 (s, 3 H), 1.35 (t, $J=7.0$ Hz, 3 H), 1.26 (s, 3 H), 1.07 (s, 3 H);

MS (DCI/ NH_3) m/z 392 ($M+H$) $^+$;

HRMS calcd for $C_{26}H_{27}NO_3$ 391.2147. Found 391.2138.

15 Example 293 10-methoxy-9-(3-propenyloxy)-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-
dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/ NH_3) m/z 404 ($M+H$) $^+$.

^1H NMR (300 MHz, DMSO) δ 7.93 (d, $J=9.0$ Hz, 1 H), 6.83 (d, $J=8.8$ Hz, 1 H), 6.61 (d, $J=9.0$ Hz, 1 H), 6.59 (d, $J=8.8$ Hz, 1 H), 6.23 (d, $J=1.5$ Hz, 1 H), 6.15-6.02 (m, 1 H), 5.81 (ddt, $J=17.3$, 10.3, 6.6 Hz, 1 H), 5.67 (dd, $J=9.8$, 3.3 Hz), 5.45 (s, 1 H), 5.44 (dd, $J=16.0$, 2.0 Hz, 1 H), 5.27 (dd, 10.6, 2.0 Hz, 1 H), 5.03 (dd, $J=10.3$, 1.8 Hz, 1 H), 4.98 (dd, $J=17.3$, 1.8 Hz, 1 H), 4.56-4.53 (m, 1 H), 2.47-2.41 (m, 1 H), 2.34-2.27 (m, 1 H), 2.16 (s, 3 H), 1.17 (s, 3 H), 1.16 (s, 3 H);

HRMS calcd for $C_{26}H_{29}NO_3$ 403.2147. Found 403.2150.

25 Example 294 10-methoxy-9-(3-propynyloxy)-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-
dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/ NH_3) m/z 402 ($M+H$) $^+$;

^1H NMR (300 MHz, DMSO) δ 7.92 (d, $J=8.8$ Hz, 1 H), 6.88 (d, $J=8.8$ Hz, 1 H), 6.62 (d, $J=8.8$ Hz, 1 H), 6.61 (d, $J=8.8$, 1 H), 6.24 (d, $J=1.7$ Hz, 1 H), 5.81 (ddt, $J=17.3$, 10.3, 6.6 Hz, 1 H), 5.72 (dd, $J=9.8$, 3.3 Hz), 5.44 (s, 1 H), 5.03 (dd, $J=10.3$, 1.8 Hz, 1 H), 4.99 (dd, $J=17.3$, 1.8 Hz, 1 H), 4.79 (d, $J=2.3$ Hz, 2 H), 3.57 (t, $J=2.3$ Hz, 1 H), 2.47-2.41 (m, 1 H), 2.34-2.27 (m, 1 H), 2.16 (s, 3 H), 1.17 (s, 3 H), 1.16 (s, 3 H);

HRMS calcd for $C_{26}H_{27}NO_3$ 401.1991. Found 401.1978

35 Example 295 2,5-dihydro-9-acetoxy-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-
[1]benzopyrano[3,4-f]quinoline

¹H NMR (400 MHz, DMSO-d₆) δ 7.78 (d, J=8.5, 1H), 6.81 (d, J=8.5, 1H), 6.60 (d, J=8.5, 1H), 6.57 (d, J=8.9, 1H), 6.18 (d, J=1.7, 1H), 5.80-5.70 (m, 2H), 5.39 (s, 1H), 4.99-4.90 (m, 2H), 3.55 (s, 3H), 2.39 (br dd, 2H), 2.23 (s, 3H), 2.10 (d, J=0.9, 3H), 1.11 (s, 3H), 1.10 (s, 3H); ¹³C NMR (100 MHz, DMSO-d₆) δ 169.3, 148.5, 148.0, 146.4, 138.6, 134.1, 133.7, 132.2, 127.4, 126.3, 120.8, 118.3, 117.4, 116.3, 115.1, 113.9, 112.7, 73.7, 60.0, 49.9, 36.7, 29.4, 29.1, 23.9, 20.6; MS (DCI/NH₃) m/e 406(M+H)⁺; Anal. Calcd for C₂₅H₂₇NO₄: C 74.05, H 6.71, N 3.45. Found: C 73.91, H 6.79, N 3.31.

Example 296 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) δ 7.86 (d, J=8.8, 1H), 6.85 (d, J=8.8, 1H), 6.68-6.62 (m, 2H), 6.25 (d, J=1.5, 1H), 5.89-5.75 (m, 2H), 5.46 (s, 1H), 5.06-4.96 (m, 2H), 3.62 (s, 3H), 3.00 (s, 3H), 2.85 (s, 3H), 2.83-2.67 (m, 4H), 2.48 (m, 1H), 2.26 (m, 1H), 2.17 (s, 3H), 1.18 (s, 3H), 1.17 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) δ 171.5, 170.4, 148.3, 148.0, 146.2, 138.5, 134.1, 133.5, 132.1, 127.3, 126.2, 120.8, 118.1, 117.2, 116.2, 115.0, 113.8, 112.5, 73.6, 60.0, 49.8, 36.6, 36.5, 34.9, 29.3, 29.0, 27.6, 23.8; MS (DCI/NH₃) m/e 491(M+H)⁺, 508(M+NH₄)⁺; Anal. Calcd for C₂₉H₂₄N₂O₅: C 71.00, H 6.99, N 5.71. Found: C 70.88, H 7.10, N 5.49.

The chemistry described above was used with Core 9 to prepare Examples 297-299.

Example 297 7-bromo -5-[3-cyclohexenyl]- 10-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 466 (M+H)⁺;

¹H NMR (300 MHz, DMSO), isomer 1: δ 8.03 (d, J=8.8 Hz, 1 H), 7.33 (d, J=9.2 Hz, 1 H), 6.65 (dd, J=8.8, 1.7 Hz, 2 H), 6.35 (d, J=1.3 Hz, 1 H), 5.91-5.43 (m, 4 H), 3.86 (s, 3 H), 2.14 (s, 3 H), 1.99 (s, 3 H), 1.31 (s, 3 H), 1.06 (s, 3 H); isomer 2: δ 8.00 (dd, J=8.8 Hz, 1 H), 7.33 (d, J=9.2 Hz, 1 H), 6.65 (dd, J=8.8, 1.7 Hz, 1 H), 6.35 (d, J=1.3 Hz, 1 H), 6.31 (d, J=1.3 Hz, 1 H), 5.91-5.43 (m, 4 H), 2.12 (s, 3 H), 1.28 (s, 3 H), 1.03 (s, 3 H);

¹³C NMR (300 MHz, DMSO) δ 155.5, 145.5, 133.9, 133.7, 129.5, 129.4, 128.5, 127.9, 127.7, 127.2, 127.0, 125.6, 118.1, 115.5, 113.2, 113.1, 106.9, 102.3, 77.2, 76.5, 55.8, 49.4, 37.6, 36.7, 29.6, 29.5, 27.4, 26.9, 25.6, 24.6, 24.2, 23.6, 21.1, 19.8;

HRMS calcd for C₂₆H₂₈NO₂⁷⁹Br 465.1303. Found 465.1284; Calcd for

C₂₆H₂₈NO₂⁸¹Br 467.1283. Found 467.1281.

Anal. calcd for C₂₆H₂₈BrNO₂: C, 66.95; H, 6.05; N, 3.00; found C, 66.77; H, 6.20; N, 2.88.

Example 298 10-methoxy-7-bromo-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-
[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 426 (M+H)⁺;

¹H NMR (300 MHz, DMSO) δ 7.93 (d, $J=8.8$ Hz, 1 H), 7.33 (d, $J=9.2$ Hz, 1 H), 6.71 (d, $J=9.2$ Hz, 1 H), 6.60 (d, $J=8.5$ Hz, 1 H), 6.25 (d, $J=1.5$ Hz, 1 H), 5.94-5.80 (m, 2 H), 5.45 (s, 1 H), 5.0 (m, 2 H), 3.86 (s, 3 H), 2.17 (d, $J=1.5$ Hz, 3 H), 1.17 (s, 6 H). ¹³C NMR (300 MHz, DMSO) 155.3, 147.0, 146.0, 133.8, 133.6, 131.8, 129.5, 127.3, 127.2, 117.4, 116.0, 115.1, 113.2, 107.1, 102.6, 74.8, 55.9, 49.8, 29.0, 23.8.

HRMS calcd for C₂₃H₂₄⁷⁹BrNO₂ 426.3502. Found 426.3496.

Anal. calcd for C₂₃H₂₄BrNO₂: C, 64.79; H, 5.67; N, 3.29; found C, 65.08; H, 5.73; N, 3.18.

Example 299 7-bromo-5-[1-methyl-3-cyclohexenyl]-10-methoxy-2,2,4-trimethyl-2,5-
dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 480 (M+H)⁺;

¹H NMR (300 MHz, DMSO) isomer 1: δ 8.02 (d, $J=8.5$ Hz, 1 H), 7.55 (d, $J=5.9$ Hz, 1 H), 7.37 (d, $J=2.6$ Hz, 1 H), 7.31 (d, $J=1.8$ Hz, 1 H), 6.67 (dd, $J=14.7, 8.8$ Hz, 1 H), 6.35 (d, $J=1.5$ Hz, 1 H), 5.63 (d, $J=5.9$ Hz, 1 H), 5.56-5.45 (m, 2 H), 3.86 (s, 3 H), 2.13 (s, 3 H), 1.61 (s, 3 H), 1.30 (s, 3 H), 1.02 (s, 3 H); isomer 2: δ 8.00 (d, $J=8.5$ Hz, 1 H), 7.54 (d, $J=5.9$ Hz, 1 H), 7.35 (d, $J=1.8$ Hz, 2 H), 6.67 (dd, $J=14.7, 8.8$ Hz, 2 H), 6.31 (d, $J=1.5$ Hz, 1 H), 5.51 (m, 2 H), 3.86 (s, 3 H), 2.08 (s, 3 H), 1.50 (s, 3 H), 1.09 (s, 3 H), 0.92 (s, 3 H);

HRMS calcd for C₂₇H₃₀NO₂⁷⁹Br 479.1460. Found 479.1463; HRMS calcd for

C₂₇H₃₀NO₂⁸¹Br 481.1439. Found 481.1456.

Anal. calcd for C₂₇H₃₀NO₂⁷⁹Br: C, 67.5; H, 6.29; N, 2.92; found C, 67.08; H, 6.38; N, 2.54.

The chemistry described above was used with Core 10 to prepare Example 300.

Example 300 10-methoxy-9-bromo-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-
[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 428 (M+H)⁺; 426;

¹H NMR (300 MHz, DMSO) δ 7.93 (d, $J=8.8$ Hz, 1 H), 7.33 (d, $J=8.5$ Hz, 1 H), 6.67 (d, $J=8.5$ Hz, 1 H), 6.65 (d, $J=8.5$ Hz, 1 H), 6.36 (d, $J=1.1$ Hz, 1 H), 5.88-5.74 (m, 2 H), 5.46 (s, 1 H), 5.05-4.95 (m, 2 H), 3.62 (s, 3 H), 2.18 (d, $J=1.1$ Hz, 3 H), 1.19 (s, 3 H), 1.16 (s, 3 H); ¹³C NMR (300 MHz, DMSO) δ 152.7, 150.8, 146.5, 134.0, 133.6, 132.1,

130.0, 127.3, 126.1, 119.3, 117.4, 116.2, 115.0, 114.6, 114.0, 109.5, 73.7, 59.6, 49.9, 36.7, 29.4, 29.1, 23.9;

HRMS calcd for $C_{23}H_{24}NO_2^{79}Br$ 425.0990. Found 425.0998; HRMS calcd for

$C_{23}H_{24}NO_2^{81}Br$ 427.0970. Found 427.0974.

Anal. calcd for $C_{23}H_{24}BrNO_2$: C, 64.79; H, 5.67; N, 3.29; found C, 64.99; H, 5.98; N, 3.13.

The chemistry detailed above was used with Core 11 to prepare Examples 301-303.

Example 301 7,9-Dibromo-10-methoxy-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (ESI) m/z 504 ($M+H$)⁺;

¹H NMR (300 MHz, DMSO) δ 7.57 (d, $J=8.9$ Hz, 1 H), 7.65 (s, 1 H), 6.66 (d, $J=8.8$ Hz, 1 H), 6.44 (s, 1 H), 5.95 (dd, $J=10.1, 3.1$ Hz, 1 H), 5.97-5.78 (m, 2 H), 5.47 (s, 1 H),

5.08-4.99 (m, 2 H), 3.62 (s, 3 H), 2.19 (s, 3 H), 1.20 (s, 3 H), 1.17 (s, 3 H); ¹³C NMR (300 MHz, DMSO) δ 152.1, 147.4, 147.0, 133.6, 132.7, 132.0, 131.7, 128.3, 127.1, 126.3, 120.5, 117.6, 115.9, 115.3, 114.0, 113.8, 110.0, 106.6, 75.2, 59.7, 49.9, 36.8, 29.6, 29.2, 23.7;

HRMS calcd for $C_{23}H_{23}^{79}Br_2NO_2$ 503.0096. Found 503.0086; HRMS calcd for

$C_{23}H_{23}^{79}Br^{81}BrNO_2$ 505.0075. Found 505.0075.

Example 302 7,9-Dibromo-5-[cyclohexen-3-yl]-10-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (ESI) m/z 544 ($M+H$)⁺;

¹H NMR (300 MHz, DMSO), 1st isomer: δ 8.81 (d, 1H, $J=8.83$ Hz), 7.67 (s, 1H), 6.70 (d, 1H, $J=8.83$ Hz), 6.59 (s, 1H), 5.82-5.59 (m, 4H), 5.50 (s, 1H), 3.61 (s, 3H), 2.49-2.27 (m, 2H), 2.15 (s, 3H), 2.04-1.81 (m, 2H), 1.79-1.41 (m, 2H), 1.32 (s, 3H), 1.08 (s, 3H); 2nd isomer: δ 7.9 (d, 1H, $J=8.83$ Hz), 7.66 (s, 1H), 6.69 (d, 1H, $J=8.83$ Hz), 6.54 (s, 1H), 5.82-5.59 (m, 4H), 5.45 (s, 1H), 3.60 (s, 3H), 2.49-2.27 (m, 2H), 2.13 (s, 3H), 2.04-1.81 (m, 2H), 1.79-1.41 (m, 2H), 1.30 (s, 3H), 1.05 (s, 3H);

HRMS calcd for $C_{26}H_{27}^{79}Br_2NO_2$ is 543.0409. Found 543.0385; HRMS calcd for $C_{26}H_{27}^{79}Br^{81}BrNO_2$ 545.0388. Found 545.0396.

Example 303 7,9-Dibromo-5-[1-methyl-3-cyclohexenyl]-10-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (ESI) m/z 560 ($M+H$)⁺;

¹H NMR (300 MHz, DMSO), isomer 1: δ 8.83 (d, $J=8.0$ Hz, 1 H), 7.37 (s, 1 H), 6.70 (d, $J=8.8$ Hz, 1 H), 6.58 (s, 1 H), 5.58 (d, $J=9.2$ Hz, 1 H), 5.49 (s, 1 H), 3.61 (s, 3 H), 2.51-2.49 (m, 4 H), 2.14 (s, 3 H), 1.31 (s, 3 H), 1.29-1.20 (m, 4 H), 1.26 (s, 3 H); isomer 2: δ 7.99 (d, $J=8.0$ Hz, 1 H), 7.37 (s, 1 H), 6.71 (d, $J=8.8$ Hz, 1 H), 6.55 (s, 1 H), 5.57 (d, $J=9.2$ Hz, 1 H), 5.45 (s, 1 H), 3.59 (s, 3 H), 2.51-2.49 (m, 4 H), 2.09 (s, 3 H), 1.30 (s, 3 H), 1.29-1.20 (m, 4 H), 1.21 (s, 3 H);
 HRMS calcd for C₂₇H₂₉Br₂NO₂ 557.0565. Found 557.0548.

The chemistry described above was used with Cores 12-17 to prepare Examples 304-310.

Example 304 10-methoxy-7-(2-ethenyl)-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-

[1]benzopyrano[3,4-f]quinoline

MS (ESI) m/z 373 (M+H)⁺;

¹H NMR (300 MHz, DMSO) δ 7.82 (d, $J=8.9$ Hz, 1 H), 7.23 (d, $J=8.9$ Hz, 1 H), 6.78 (dd, $J=11.0, 6.8$ Hz, 1 H), 6.61 (d, $J=8.9$ Hz, 1 H), 6.49 (d, $J=8.5$ Hz, 1 H), 5.99 (d, $J=1.7$ Hz, 1 H), 5.74 (dd, $J=7.6, 3.0$ Hz, 1 H), 5.71-5.63 (m, 1 H), 5.57 (dd, $J=7.6, 1.7$ Hz, 1 H), 5.32 (s, 1 H), 5.00 (dd, $J=9.3, 1.7$ Hz, 1 H), 4.92 (dd, $J=10.2, 1.7$ Hz, 1 H), 4.83 (dd, $J=16.9, 1.7$ Hz, 1 H), 3.75 (s, 3 H), 2.06 (s, 3 H), 1.53-1.41 (m, 2 H), 1.24-1.15 (m, 3 H), 1.05 (d, $J=2.1$ Hz, 1 H); ¹³C NMR (300 MHz, DMSO) δ 155.66, 147.91, 145.55, 134.17, 133.45, 131.98, 130.77, 127.37, 127.28, 123.88, 119.52, 117.21, 115.99, 115.80, 113.20, 113.18, 112.12, 105.59, 74.01, 55.59, 49.69, 36.40, 29.03, 28.83, 27.67, 26.19, 23.83, 13.55;

HRMS calcd for C₂₅H₂₇NO₂ 373.2042. Found 373.2048.

Example 305 10-methoxy-7-methyl-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-

[1]benzopyrano[3,4-f]quinoline

MS (ESI) m/z 362 (M+H)⁺;

¹H NMR (300 MHz, DMSO) δ 7.92 (d, $J=8.5$ Hz, 1 H), 6.93 (d, $J=8.5$ Hz, 1 H), 6.59 (dd, $J=5.5, 2.6$ Hz, 1 H), 6.10 (s, 1 H), 5.90-5.76 (m, 2 H), 5.44 (s, 1 H), 5.07-4.90 (m, 2 H), 3.82 (s, 3 H), 2.17 (s, 3 H), 2.08 (s, 3 H), 1.99 (s, 3 H), 1.16 (s, 3 H), 1.15 (s, 3 H); ¹³C NMR (300 MHz, DMSO), 154.2, 148.5, 145.4, 134.5, 133.4, 131.9, 127.8, 127.4, 127.1, 118.2, 117.0, 116.3, 116.0, 113.1, 112.9, 104.8, 73.6, 55.5, 49.6, 36.5, 28.9, 28.8, 23.8, 15.0;

HRMS calcd for C₂₄H₂₇NO₂ 361.2042. Found 361.2045.

Example 306 10-methoxy-7-acetyl-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-
[1]benzopyrano[3,4-f]quinoline

MS (ESI) m/z 390 (M+H)⁺.

¹H NMR (300 MHz, DMSO), 7.88 (d, $J=8.8$ Hz, 1 H), 7.59 (d, $J=8.8$ Hz, 1 H), 6.84 (d, $J=8.8$ Hz, 1 H), 6.62 (d, $J=8.8$ Hz, 1 H), 6.22 (d, $J=1.5$ Hz, 1 H), 6.01-5.97 (m, 1 H), 5.90-5.69 (m, 1 H), 5.46 (s, 1 H), 5.03-4.83 (m, 2 H), 3.93 (s, 3 H), 2.53 (s, 3 H), 2.20 (d, $J=1.5$ Hz, 3 H), 1.19 (s, 3 H), 1.16 (s, 3 H).

Example 307 (+/-) 2,5-dihydro-9-methyl-10-methoxy-2,2,4-trimethyl-5-(1-
methylcyclohexen-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 416 (M+H)⁺.

Example 308 10-methoxy-7-methyl-9-methyl-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-
dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 376 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) 7.95 (d, $J=8.5$ Hz, 1 H), 6.81 (s, 1 H), 6.62 (d, $J=8.5$ Hz, 1 H), 6.17 (d, $J=1.5$ Hz, 1 H), 5.89-5.76 (m, 2 H), 5.44 (br s, 1 H), 5.04 (dd, $J=10.3$, 1.8 Hz, 1 H), 4.94 (dd, $J=17.3$, 1.8 Hz, 1 H), 3.52 (s, 3 H), 2.46-2.40 (m, 1 H), 2.28-2.24 (m, 1 H), 2.18 (s, 3 H), 2.17 (s, 3 H), 2.07 (s, 3 H), 1.19 (s, 3 H), 1.14 (s, 3 H);
HRMS calcd for C₂₅H₂₉NO₂ 375.2198. Found: 375.2214.

Example 309 10-chloro-5-(3-propenyl)-2,2,4-trimethyl-2,5-dihydro-1H-
[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 352 (M+H)⁺;

¹H NMR (300 MHz, DMSO) 7.93 (d, $J=8$ Hz, 1 H), 7.12-7.10 (m, 2 H), 6.90-6.84 (m, 1 H), 6.65 (10, 2 Hz, 1 H), 4.97 (dd, $J=17$, 2 Hz, 1 H), 2.47-2.26 (m, 2 H), 2.16 (s, 3 H), 1.23 (s, 3 H), 1.17 (s, 3 H);

HRMS (FAB) calcd m/z for C₂₂H₂₂ClNO: 351.1390 (M)⁺. Found: 351.1385.

Example 310 (+/-) 2,5-dihydro-10-chloro-2,2,4-trimethyl-5-phenyl-1H-
[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 288 (M+H)⁺;

¹H NMR (200 MHz, DMSO) 7.98 (d, $J=8$ Hz, 1 H), 7.27-7.14 (m, 5 H), 6.97-6.80 (m, 2 H), 6.81 (br s, 1 H), 6.78-6.72 (m, 2 H), 6.44 (br s, 1 H), 5.40 (br s, 1 H), 1.81 (br s, 2 H), 1.26 (s, 2 H), 1.16 (s, 2 H);

HRMS (FAB) calcd m/z for C₂₅H₂₃ClNO: 387.1390 (M)⁺. Found: 287.1286.

Example 311

2,5-dihydro-10-methoxy-5-(3-(N-methyl-N-(carbomethoxymethyl)aminocarbonyloxy)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 13 and N-methyl-N-(methylglycinate)carbamoyl chloride were processed as in Example 14 to provide the desired compound.

MS (DCI/NH₃) m/e 529 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) δ 8.00(d, 1H), 7.21(m, 1H), 7.03(d, 1H), 6.92(m, 3H), 6.72(m, 3H), 6.55(d, 1H), 6.45(t, 1H), 5.40(s, 1H), 4.15(s, 1H), 4.05(s, 1H), 3.78(s, 3H), 3.65(s, 3H), 3.00(s, 1H), 2.88(s, 2H), 1.84(s, 3H), 1.22(s, 3H), 1.13(s, 3H).

Anal. calcd for C₃₁H₃₂N₂O₆: C, 70.43; H, 6.10; N, 5.29. Found: C, 70.98; H, 6.33; N, 4.85

Example 312

2,5-dihydro-10-methoxy-5-(3-(N-methyl-N-(N-methylcarbonyl)aminocarbonyloxy)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 13 and methylisocyanate were processed as in Example 14 to provide the desired compound.

MS (DCI/NH₃) m/e 514 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) δ 8.18(q, 1H), 8.01(d, 1H), 7.27(t, 1H), 7.06(t, 2H), 6.98(s, 1H), 6.91(t, 1H), 6.77(s, 1H), 6.70(d, 1H), 6.56(d, 1H), 6.46(d, 1H), 6.19(s, 1H), 5.38(s, 1H), 3.78(s, 3H), 3.19(s, 3H), 2.70(d, 3H), 1.84(s, 3H), 1.22(s, 3H), 1.14(s, 3H).

Anal. calcd for C₃₀H₃₁N₃O₅·2H₂O: C, 65.55; H, 6.41; N, 7.60. Found: C, 65.71; H, 6.20; N, 7.05

Example 313

2,5-dihydro-10-methoxy-5-(3-(N-methylaminocarbonyloxy)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 13 and methylisocyanate were processed as in Example 14 to provide the desired compound.

MS (DCI/NH₃) m/e 457 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) δ 8.01(d, 1H), 7.50(q, 1H), 7.21(t, 1H), 7.02(d, 1H), 6.92(dd, 2H), 6.80(s, 1H), 6.77(s, 1H), 6.70(dd, 1H), 6.56(d, 1H), 6.46(d, 1H), 6.18(s, 1H), 5.40(s, 1H), 3.80(s, 3H), 2.60(d, 3H), 1.86(s, 3H), 1.23(s, 3H), 1.15(s, 3H)

Anal. calcd for C₂₈H₂₈N₂O₄·0.50H₂O: C, 72.33; H, 6.27; N, 6.01. Found: C, 72.20; H, 6.38; N, 5.78

Example 3142,5-dihydro-10-methoxy-5-(3-(2-hydroxyethyl)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

5 A solution of 3-(2'-methoxymethoxy)ethylphenyl bromide (3.55 g, 14.5 mmol) in THF (150 ml) at -78 °C was treated with n-butyllithium (2.5 M in hexane, 5.80 ml) over 15 minutes, warmed to -30 °C, cooled down to -78 °C, treated with compound 1F in one portion, warmed to -50 °C, quenched with saturated ammonium chloride, and allowed to warm to ambient temperature and settle. The supernatant was decanted and concentrated, and the residue was partitioned between water and ethyl acetate. The organic layer was washed sequentially with water and brine, dried (Na₂SO₄) and concentrated. Flash chromatography of the residue on silica gel with 20-35% ethyl acetate/hexane provided 0.82 g (56%) of the title 5-(3'-MOMO-phenyl)hemiketal. MS (DCI/NH₃) m/e 489 (M+H)⁺

15 A solution of of the hemiketal prepared above (0.70 g, 1.43 mmol) in methanol (10 ml) was treated with saturated hydrogen chloride in methanol (20 ml) at ambient temperature, stirred for 18 hours, poured into 1:1 ethyl acetate/saturated ammonium chloride. The separated aqueous layer was extracted with ethyl acetate, and the combined acetate layers were sequentially washed with water and brine, dried (Na₂SO₄) and concentrated to provide 0.52 g (82%) of the unmasked hemiketal. MS (DCI/NH₃) m/e 444 (M+H)⁺.

20 A solution of the unmasked hemiketal prepared above (0.45 g, 1.00 mmol) and triethylsilane (1.16 g, 10 mmol) in dichloromethane (20 mL) was treated with boron trifluoride etherate (1.42 g, 10 mmol) at ambient temperature, stirred for 18 hours, and poured into 1:1 ethyl acetate/saturated NaHCO₃. The separated aqueous layer was extracted with ethyl acetate, and the combined extracts were washed sequentially with water and brine, dried (Na₂SO₄) and concentrated. Flash chromatography of the residue on silica gel with 25-45% ethyl acetate in hexane provided 0.342 of the title compound. MS (DCI/NH₃) m/e 428 (M+H)⁺;

30 ¹H NMR (300 MHz, DMSO-d₆) δ 8.00(d, 1H), 7.00(m, 5H), 6.74(s, 1H), 6.70(d, 1H), 6.55(d, 1H), 6.45(d, 1H), 6.16(s, 1H), 5.39(s, 1H), 4.54(t, 1H), 3.79(s, 3H), 3.44(q, 4H), 2.59(t, 2H), 1.86(s, 3H), 1.22(s, 3H), 1.11(s, 3H);
Anal. calcd for C₂₈H₂₉NO₃: C, 78.66; H, 6.83; N, 3.27. Found: C, 78.48; H, 6.85; N, 3.29.

Example 3152,5-dihydro-10-methoxy-5-(3-(2-methanesulfonyloxyethyl)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A solution of Example 314 (200 mg, 0.47 mmol) and triethylamine (94 mg, 0.94 mmol) in CH₂Cl₂ (6 ml) at 0 °C was treated with methanesulfonyl chloride (64 mg, 0.56 mmol), stirred for 30 minutes, and quenched with saturated NaHCO₃. The separated aqueous layer was extracted with CH₂Cl₂, and the combined organic layers were washed with brine, dried (Na₂SO₄) and concentrated. Flash chromatography of the residue on silica gel with 10-30% ethyl acetate/hexane provided 0.30 g (97%) of the title compound.

MS (DCI/NH₃) m/e 506 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.00(d, 1H), 7.18(s, 1H), 7.14(d, 1H), 7.09(d, 1H), 6.96(d, 1H), 6.90(t, 1H), 6.75(s, 1H), 6.70(d, 1H), 6.55(d, 1H), 6.45(d, 1H), 6.21(s, 1H), 5.39(s, 1H), 4.27(t, 2H), 3.79(s, 3H), 2.88(s, 3H), 2.87(t, 2H), 1.84(s, 3H), 1.24(s, 3H), 1.14(s, 3H)

Anal. calcd for C₂₉H₃₁NO₅S: C, 68.88; H, 6.17; N, 2.77. Found: C, 69.08; H, 6.14; N, 2.63.

Example 3162,5-dihydro-10-methoxy-5-(3-(2-methylthioethyl)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A solution of Example 315 (10 mg, 0.02 mmol) in DMF (1 ml) was treated with NaSMc (14 mg, 0.20 mmol) at ambient temperature, stirred for 2 hr, quenched with saturated NaHCO₃, and extracted with ethyl acetate. The organic layer was washed with brine, dried (Na₂SO₄) and concentrated. Flash chromatography of the residue on silica gel with 10-30% ethyl acetate/hexane provided 9 mg (99%) of the title compound.

MS (DCI/NH₃) m/e 458 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) δ 8.00(d, 1H), 7.11(t, 1H), 7.07(s, 1H), 7.02(d, 1H), 6.96(d, 1H), 6.90(t, 1H), 6.75(s, 1H), 6.70(d, 1H), 6.54(d, 1H), 6.44(d, 1H), 6.16(s, 1H), 5.39(s, 1H), 3.77(s, 3H), 2.70(t, 2H), 2.54(t, 2H), 1.91(s, 3H), 1.95(s, 3H), 1.21(s, 3H), 1.15(s, 3H)

Example 3172,5-dihydro-10-methoxy-5-(3-(2-(N,N-dimethylaminocarbonyloxy)ethyl)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 314 and N,N-dimethylcarbamoyl chloride were processed as in Example 14 to provide the desired compound.

MS (DCI/NH₃) m/e 499 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) δ 8.01(d, 1H), 7.00(m, 5H), 6.76(s, 1H), 6.70(d, 1H), 6.55(s, 1H), 6.44(d, 1H), 6.15(s, 1H), 5.39(s, 1H), 4.01(t, 2H), 3.78(s, 3H), 2.79(t, 2H), 2.77(s, 3H), 2.65(s, 3H), 1.84(s, s, 3H), 1.23(s, 3H), 1.15(s, 3H)
Anal. calcd for C₃₁H₃₄N₂O₄: C, 74.67; H, 6.87; N, 5.61. Found: C, 74.45; H, 6.73; N, 5.45.

Example 318

2,5-dihydro-10-methoxy-5-(3-(2-(N,N-dimethylamino)ethyl)phenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 315 and dimethylamine were processed as in Example 316 to provide the desired compound.

MS (DCI/NH₃) m/e 455 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) δ 8.00(d, 1H), 7.09(t, 1H), 7.01(d, 1H), 6.97(m, 2H), 6.90(t, 1H), 6.73(s, 1H), 6.69(d, 1H), 6.55(d, 1H), 6.44(d, 1H), 6.16(s, 1H), 5.39(s, 1H), 3.79(s, 3H), 2.54(t, 2H), 2.25(t, 2H), 2.08(s, 6H), 1.87(s, 3H), 1.22(s, 3H), 1.17(s, 3H).

Example 319

2,5-dihydro-10-methoxy-5-cyclopropyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 319A

A mixture of Example 1F (4.43 g, 13.7 mmol), 4-chlorophenol (9.28 g, 72.1 mmol) and MgSO₄ (8.69 g, 72.1 mmol) in CH₂Cl₂ (100 ml) at ambient temperature was stirred for 12 hr, diluted with ethyl acetate (200 ml), washed with 1M aq NaOH twice and brine respectively, dried (Na₂SO₄) and concentrated. The residue was triturated with hot ethyl acetate (25 ml) to provide the desired phenyl acetal.
MS (DCI/NH₃) m/e 306 (M-4-Cl-ph)⁺

Example 319B

A solution of the Example 319A (131 mg, 0.30 mmol) in toluene (20 ml) at 0 °C was treated with cyclopropylmagnesium bromide made by refluxing cyclopropyl bromide (363 mg, 3.0 mmol) and Mg (73 mg, 3.0 mmol) in THF (1.5 ml) for 30 min. The final solution was allowed to warm to ambient temperature and stirred for 12 hr, quenched with sat. NH₄Cl. The organic layer was washed with 1M aq NaOH twice and brine respectively, dried (Na₂SO₄) and concentrated. Flash chromatography of the residue on silica gel with 5-15% ethyl acetate/hexane provided 18 mg (17%) of the title compound.

MS (DCI/NH₃) m/e 348 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) □ 8.01(d, 1H), 7.04(t, 1H), 6.67(d, 1H), 6.60(d, 1H), 6.57(d, 1H), 6.16(s, 1H), 5.44(s, 1H), 5.42(d, 1H), 3.85(s, 3H), 2.12(s, 3H), 1.26(s, 3H), 1.05(s, 3H), 0.28(m, 4H), 0.08(m, 1H).

Example 320

2,5-dihydro-10-methoxy-5-ethenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A solution of 2B (34 mg, 0.1 mmol) and tributylvinyltin (96 mg) in CH₂Cl₂ (2 ml) was treated with boron trifluoride etherate (43 mg, 0.3 mmol) at -78 °C, and allowed to warm to ambient temperature with stirring for 2 hr. The reaction was then quenched with sat. NaHCO₃, and the organic layer was washed with sat. NaHCO₃ and brine respectively, dried (Na₂SO₄) and concentrated. Flash chromatography of the residue on silica gel with 5-15% ethyl acetate/hexane provided 27 mg (81%) of the title compound. MS (DCI/NH₃) m/e 334 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) □ 7.93(d, 1H), 7.02(t, 1H), 6.63(dd, 2H), 6.54(d, 1H), 6.19(d, 1H), 6.10(s, 1H), 5.93(m, 1H), 5.42(s, 1H), 5.16(dt, 1H), 4.91(dt, 1H), 3.83(s, 3H), 2.11(s, 3H), 1.21(s, 3H), 1.13(s, 3H).

Example 321

trans 2,5-dihydro-10-methoxy-5-(2-phenylethenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A mixture of Example 320 (13 mg, 0.039 mmol), iodobenzene (12 mg, 0.058 mmol), palladium (II) acetate (18 mg, 0.008 mmol), tri(o-tolyl)phosphine (3.6 mg, 0.012 mmol), triethylamine (12 mg, 0.12 mmol) in CH₃CN (1 ml) was heated to 80 °C for 4 hr in a sealed tube. After solvent removal, flash chromatography of the residue on silica gel with 5-15% ethyl acetate/hexane provided 7 mg (44%) of the title compound. MS (DCI/NH₃) m/e 410 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) □ 7.99(d, 1H), 7.22(m, 4H), 7.19(m, 1H), 7.00(t, 1H), 6.67(d, 1H), 6.63(d, 1H), 6.57(d, 1H), 6.38(q, 1H), 6.34(d, 1H), 6.27(d, 1H), 6.14(s, 1H), 5.43(s, 1H), 3.82(s, 1H), 2.12(s, 3H), 1.22(s, 3H), 1.13(s, 3H).

Example 322

2,5-dihydro-10-methoxy-5-(2-phenylethynyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 2B and tributylphenylacetylenyltin were processed as in Example 320 to provide the desired compound. MS (DCI/NH₃) m/e 408 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) □ 7.92(d, 1H), 7.29(m, 3H), 7.16(m, 2H), 7.10(d, 1H), 6.78(d, 1H), 6.65(dd, 1H), 6.59(s, 1H), 6.23(s, 1H), 5.45(s, 1H), 3.87(s, 3H), 2.33(s, 3H), 1.28(s, 3H), 1.12(s, 3H)

Example 323

cis 2,5-dihydro-10-methoxy-5-(2-phenylethenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A mixture of Example 322 (20 mg, 0.049 mmol), palladium/BaSO₄ (20 mg) in pyridine (2 ml) was stirred at ambient temperature for 12 hr, quenched with water, and extracted with ethyl acetate. The organic layer was washed with brine, dried (Na₂SO₄), and concentrated. Flash chromatography of the residue on silica gel with 5-15% ethyl acetate/hexane provided 13 mg (75%) of the title compound.

MS (DCI/NH₃) m/e 410 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) □ 7.97(d, 1H), 7.62(d, 2H), 7.48(t, 2H), 7.39(t, 1H), 7.03(t, 1H), 6.72(d, 1H), 6.63(d, 1H), 6.61(d, 1H), 6.52(d, 1H), 6.12(d, 1H), 6.10(s, 1H), 5.70(dd, 1H), 5.27(s, 1H), 3.87(s, 3H), 1.55(s, 3H), 1.17(s, 3H), 1.079s, 3H)

Example 324

2,5-dihydro-10-methoxy-5-(2-methylpropenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 2B and tributyl-(2-methylpropenyl)tin were processed as in Example 320 to provide the desired compound.

MS (DCI/NH₃) m/e 362 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) □ 7.92(d, 1H), 6.99(t, 1H), 6.65(d, 1H), 6.58(d, 1H), 6.44(d, 1H), 6.24(d, 1H), 6.21(s, 1H), 5.40(s, 1H), 5.18(d, 1H), 3.85(s, 3H), 2.07(s, 3H), 1.84(s, 3H), 1.58(s, 3H), 1.23(s, 3H), 1.10(s, 3H)

Anal. calcd for C₂₄H₂₇NO₂: C, 79.74; H, 7.52; N, 3.87. Found: C, 79.34; H, 7.25; N, 3.68

Example 325

trans 2,5-dihydro-10-methoxy-5-(1-cyclohexenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 2B and tributyl-(1-cyclohexenyl)tin were processed as in Example 320 to provide the desired compound.

MS (DCI/NH₃) m/e 388 (M+H)⁺

¹H NMR (300 MHz, DMSO-d₆) □ 7.91(d, 1H), 7.00(t, 1H), 6.64(d, 1H), 6.60(d, 1H), 6.49(d, 1H), 6.02(s, 1H), 5.85(s, 1H), 5.39(s, 1H), 5.14(s, 1H), 3.81(s, 3H), 2.18(m, 1H),

2.03(s, 3H), 1.98(m, 1H), 1.81(m, 1H), 1.64(m, 1H), 1.42(m, 3H), 1.24(m, 1H), 1.22(s, 3H), 1.13(s, 3H)
Anal. calcd for C₂₆H₂₉NO₂·1.25H₂O: C, 76.15; H, 7.74; N, 3.41. Found: C, 76.12; H, 7.34; N, 3.21

Example 326

2,5-dihydro-10-(2-furanyl)-5-(3-propenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A magnetically stirred mixture of triflate 3C [from the original patent application] (196 mg, 0.421 mmol) and 2-(tributylstannyl)furan (0.250 mL, 0.79 mmol) and [1,1'-bis(diphenylphosphino)ferrocene]dichloropalladium(II) methylene chloride complex (25 mg, 0.031 mmol) and tetrabutylammonium iodide (25 mg, 0.068 mmol) in dry NMP (6.5 mL) was heated at 70°C for 5h under argon. The reaction was allowed to cool to room temperature, was diluted with satd aq NaCl and extracted with ethyl acetate (5 x 20 mL). The combined organic layer was dried (MgSO₄), filtered, and concentrated. The crude material was chromatographed on silica gel (16g) using ethyl acetate-hexane (10:90) to give product contaminated with starting material. The material was applied to three 10 x 20 cm, 0.25 mm thick silica gel plates which were eluted four times with EtOAc-hexane (5:95). The product band was scraped off and extracted with ethyl acetate to furnish 23 mg (0.044 mmol, 14%) of desired furan as a viscous syrup: ¹H NMR δ 7.67 (d, 1H, J=1.0Hz), 7.18 (t, 1H, J=7.8Hz), 7.08 (m, 1H), 6.91 (dd, 1H, J=8.1Hz, J=1.4Hz), 6.64 (m, 2H), 6.35 (d, 1H, J=8.5Hz), 6.25 (d, 1H, J=8.5Hz), 6.14 (m, 1H), 5.82 (m, 2H), 5.43 (s, 1H), 5.05 (dd, 1H, J=10.5Hz, J=1.5Hz), 4.99 (dd, 1H, J=17.3Hz, J=1.5Hz), 2.40 (m, 2H), 2.19 (s, 3H), 1.20 (s, 3H), 1.12 (s, 3H); mass spectrum (DCI) m/z 384 (M + 1). Anal. Calcd for C₂₆H₂₅NO₂: C, 81.43; H, 6.57; N, 3.65. Found: C, 81.24; H, 6.62; N, 3.66.

Example 327

2,5-dihydro-10-cyano-5-(3-propenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A magnetically stirred mixture of triflate 3C (195 mg, 0.419 mmol), 36 mg (0.031 mmol) of tetrakis(triphenylphosphine)palladium(0) and zinc cyanide (36 mg, 0.31 mmol) in dry dioxane (4.0 mL) and water (1.0 mL) was heated at 80°C for 48h under argon. The reaction was allowed to cool to room temperature, was diluted with ethyl acetate (25 mL) and washed with satd aq NaCl. The aqueous layer was extracted with ethyl acetate (2 x 20 mL). The combined organic layer was dried (MgSO₄), filtered, and concentrated. The crude material was chromatographed on silica gel (20 g) using ethyl acetate-hexane (10:90) to give product contaminated with starting triflate. The partially

pure nitrile was applied to two 10 x 20 cm, 0.25 mm thick silica gel plates which were eluted five times with EtOAc-hexane (5:95). The product band was scraped off and extracted with ethyl acetate to furnish 17.3 mg (0.0505 mmol, 12%) of desired nitrile: ^1H NMR δ 7.87 (d, 1H, J=8.5Hz), 7.46 (dd, 1H, J=7.5Hz, J=1.5Hz), 7.27 (t, 1H, J=7.8Hz), 7.19 (dd, 1H, J=8.1Hz, J=1.4Hz), 6.71 (d, 1H, J=8.5Hz), 6.57 (m, 1H), 5.90 (dd, 1H, J=10Hz, J=3.6Hz), 5.82 (m, 1H), 5.49 (m, 1H), 5.04 (dm, 1H, J=10.5Hz), 4.98 (dm, 1H, J=17.3Hz), 2.38 (m, 1H), 2.30 (m, 1H), 2.19 (s, 3H), 1.20 (s, 3H), 1.19 (s, 3H); mass spectrum (APCI) m/z 343 (M + 1); Calcd for $\text{C}_{23}\text{H}_{22}\text{N}_2\text{O}$: 342.1732. Found: 342.1730.

Example 328

2,5-dihydro-10-carboxy-5-(3-propenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A magnetically stirred mixture of the Example 4 (31 mg, 0.082 mmol) and sodium cyanide (51 mg, 0.78 mmol) in dry dimethylsulfoxide (2.5 mL) was heated at 110°C for 5h under argon. The reaction was allowed to cool to room temperature, was diluted with satd aq NaCl and extracted with ethyl acetate (5 x 20 mL). The combined organic layer was dried (MgSO_4), filtered, and concentrated. The crude material was applied to two 10 x 20 cm, 0.25 mm thick silica gel plates which were eluted twice with EtOAc-hexane (10:90), then EtOAc-hexane (50:50) three times. The product band was scraped off and extracted with ethyl acetate to furnish 16 mg (0.044 mmol, 54%) of desired carboxylic acid as a viscous syrup: ^1H NMR δ 7.16 (m, 2H), 7.02 (d, 1H, J=8.5Hz), 6.98 (dd, 1H, J=5.5Hz, J=3.7Hz), 6.58 (d, 1H, J=8.5Hz), 6.29 (m, 1H), 5.82 (m, 2H), 5.45 (s, 1H), 5.05 (dd, 1H, J=10.5Hz, J=1.5Hz), 4.98 (dd, 1H, J=17.3Hz, J=1.5Hz), 2.30 (m, 2H), 2.18 (s, 3H), 1.20 (s, 3H), 1.16 (s, 3H); mass spectrum (APCI) m/z 362 (M + 1).
Anal. Calcd for $\text{C}_{23}\text{H}_{23}\text{NO}_3$: C, 76.43; H, 6.41; N, 3.88. Found: C, 76.24; H, 6.46; N, 3.66.

Example 329

2,5-dihydro-10-(2-hydroxymethyl)-5-(3-propenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a magnetically stirred solution of example 4 (32 mg, 0.085 mmol) in dry methylene chloride (3 mL), cooled to -78°, was added dropwise 1.0M diisobutylaluminum hydride in cyclohexane (0.400 mL, 0.40 mmol) under dry argon. The temperature of the reaction was allowed to rise to 0°C. After 3.5h, the reaction was quenched by addition to aqueous Rochelle's salt and the layers were separated. The aqueous layer was extracted with ethyl acetate (3 x 40 mL). The combined organic layer

was dried (MgSO₄), filtered, and concentrated. The crude material was applied to two 10 x 20 cm, 0.25 mm thick silica gel plates which were eluted with hexane, then EtOAc-hexane (10:90) three times. The product band was scraped off and extracted with ethyl acetate to furnish 27 mg (0.078 mmol, 91%) of desired alcohol as a viscous syrup: ¹H NMR δ 7.47 (d, 1H, J=8.5Hz), 7.14 (m, 2H), 6.80 (dd, 1H, J=7.3Hz, J=1.8Hz), 6.64 (d, 1H, J=8.5Hz), 6.17 (m, 1H), 5.81 (ddm, 1H, J=10.5Hz, J=17.1Hz), 5.73 (dd, 1H, J=3.4Hz, J=10.5Hz), 5.46 (m, 1H), 5.32 (dd, 1H, J=6.3Hz, J=4.2Hz), 5.02 (dm, 1H, J=10.5Hz), 4.94 (dm, 1H, J=17.1Hz), 4.62 (m, 2H), 2.30 (m, 2H), 2.17 (s, 3H), 1.19 (s, 3H), 1.16 (s, 3H); mass spectrum (ESI) m/z: 348 (M + 1); Calcd for C₂₃H₂₅NO₂: 347.1885. Found: 347.1897.

Example 330

2,5-dihydro-10-formyl-5-(3-propenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A magnetically stirred mixture of the Example 329 (185 mg, 0.532 mmol) and tetrapropylammonium perruthenate (205 mg, 0.583 mmol) in dry methylene chloride (10 mL) was stirred for 1.5h under argon. The reaction was filtered through celite, the filter pad was washed with ethyl acetate and the filtrate was concentrated. The crude material was chromatographed on silica gel (20 g) using EtOAc-hexane (10:90) to furnish 144 mg (0.417 mmol, 78%) of desired aldehyde: ¹H NMR δ 10.11 (s, 1H), 7.45 (dd, 1H, J=7.8Hz, J=1.2Hz), 7.29 (t, 1H, J=7.8Hz), 7.16 (dd, 1H, J=7.8Hz, J=1.4Hz), 6.84 (d, 1H, J=8.5Hz), 6.70 (d, 1H, J=8.5Hz), 6.53 (m, 1H), 5.91 (dm, 1H, J=10.0Hz), 5.84 (m, 1H), 5.51 (s, 1H), 5.05 (dm, 1H, J=10.5Hz), 4.97 (dm, 1H, J=17.3Hz), 2.40 (m, 2H), 2.21 (s, 3H), 1.22 (s, 3H), 1.18 (s, 3H); mass spectrum (APCI) m/z 346 (M + 1); Calcd for C₂₃H₂₃NO₂: 345.1729. Found: 345.1732.

Example 331

2,5-dihydro-10-aminomethyl-5-(3-propenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a magnetically stirred solution of Example 330 (40 mg, 0.116 mmol) and ammonium acetate (77 mg, 1.0 mmol) in dry methanol (10 mL) was added sodium cyanoborohydride (14 mg, 0.23 mmol) under nitrogen. After 5h, the reaction was quenched by addition to 10% sodium carbonate and extracted with ethyl acetate (3 x 40 mL). The combined organic layer was dried (MgSO₄), filtered, and concentrated. The crude material was applied to two 10 x 20 cm, 0.25 mm thick silica gel plates which were eluted with hexane, then EtOAc-hexane (20:80) four times. The product band was scraped off and extracted with ethyl acetate to furnish 8.0 mg (0.023 mmol, 20%) of desired amine as a viscous syrup: ¹H NMR δ 7.55 (d, 1H, J=8.5Hz), 7.14 (m, 2H), 6.80

(dd, 1H, J=7.3Hz, J=1.8Hz), 6.64 (d, 1H, J=8.5Hz), 6.17 (m, 1H), 5.81 (ddm, 1H, J=10.5Hz, J=17.1Hz), 5.73 (dd, 1H, J=3.4Hz, J=10.5Hz), 5.46 (m, 1H), 5.02 (dm, 1H, J=10.5Hz), 4.94 (dm, 1H, J=17.1Hz), 4.62 (m, 2H), 3.88 (m, 2H), 2.30 (m, 2H), 2.17 (s, 3H), 1.19 (s, 3H), 1.16 (s, 3H); mass spectrum (ESI) m/z: 347 (M + 1); Calcd for C₂₃H₂₆N₂O: 346.2045. Found: 346.2047.

Example 332

2,5-dihydro-10-methoxymethyl-5-(3-propenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a magnetically stirred solution of Example 329 (26 mg, 0.075 mmol) in dry THF (2.0 mL), cooled in an ice bath, was added 0.14 mL of 1M potassium hexamethyldisilazide in hexane under argon. Methyl iodide (13.8 mg, 0.097 mmol) was added and the reaction was allowed to slowly come to room temperature. The reaction was quenched with satd aq NH₄Cl and extracted with ethyl acetate (3 x 10 mL). The extracts were dried (MgSO₄), filtered, and concentrated. The crude material was applied to three 10 x 20 cm, 0.25 mm thick silica gel plates which were eluted four times with EtOAc-hexane (5:95). The product band was extracted using EtOAc to furnish 25 mg (0.069 mmol, 92%) of desired methyl ether: ¹H NMR δ 7.34 (d, 1H, J=8.5Hz), 7.11 (m, 2H), 6.85 (dd, 1H, J=7.1Hz, J=2.4Hz), 6.64 (d, 1H, J=8.5Hz), 6.20 (m, 1H), 5.81 (dm, 1H, J=10.2Hz), 5.75 (m, 1H), 5.46 (s, 1H), 5.02 (dm, 1H, J=10.2Hz), 4.93 (dm, 1H, J=17.3Hz), 4.61 (d, 1H, J=11.2Hz), 4.43 (d, 1H, J=11.2Hz), 3.37 (s, 3H), 2.33 (m, 1H), 2.27 (m, 1H), 2.17 (s, 3H), 1.19 (s, 3H), 1.17 (s, 3H); mass spectrum (ESI) m/z 362 (M + 1); Calcd for C₂₄H₂₇NO₂: 361.2042. Found: 361.2047.

Example 333 2,5-dihydro-10-ethenyl-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 333A

2,5-dihydro-10-ethenyl-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 7 and trifluoromethanesulfonic anhydride were processed as in Example 3C to provide the desired triflate.
MS (ESI) m/z 502 (M+H)⁺.

Example 333

2,5-dihydro-10-ethenyl-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 333A and vinyl tributylstannane were processed as in Example 5 to provide the desired compound.
MS (DCI/NH₃) m/z 380 (M+H)⁺;

^1H NMR (300 MHz, CDCl_3) δ 7.30-7.11 (m, 6 H), 7.02-6.89 (m, 3 H), 6.78 (s, 1 H), 6.76-6.68 (m, 2 H), 6.32 (br s, 1 H), 5.72 (br d, $J=11.4$ Hz, 1 H), 5.40 (br s, 1 H), 5.30 (br d, $J=15.9$ Hz, 1 H), 1.81 (s, 3 H), 1.26 (s, 3 H), 1.15 (s, 3 H);

^{13}C NMR (125 MHz, DMSO) δ 151.3, 145.7, 138.8, 137.3, 133.3, 133.0, 131.2, 128.5 (2), 128.3, 128.2, 128.0 (2), 127.8, 127.4, 126.6, 123.9, 120.8, 118.1, 116.2, 114.5, 113.6, 75.3, 50.0, 30.0, 28.7, 23.2;

HRMS (FAB) calcd m/z for $\text{C}_{27}\text{H}_{25}\text{NO}$: 379.1936 (M) $^+$. Found: 379.1924.

Example 334 2,5-dihydro-10-ethynyl-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 333A and (trimethylsilyl)acetylene were processed as in Example 6A and Example 6 to provide the desired compound.

MS (DCI/ NH_3) m/z 378 ($\text{M}+\text{H}$) $^+$;

^1H NMR (300 MHz, DMSO) δ 8.32 (d, $J=8.8$ Hz, 1 H), 7.27-7.16 (m, 5 H), 7.01 (dd, $J=8.7, 1.8$ Hz, 1 H), 6.83 (t, $J=8.6$ Hz, 1 H), 6.84-6.79 (m, 1 H), 6.81 (br s, 1 H), 6.74 (d, $J=8.6$ Hz, 1 H), 6.42 (br s, 1 H), 5.41 (br s, 1 H), 4.38 (s, 1 H), 2.03 (s, 3 H), 1.24 (s, 3 H), 1.18 (s, 3 H);

^{13}C NMR (125 MHz, DMSO) δ 150.9, 146.4, 138.8, 133.1, 130.7, 128.6, 128.2 (2), 128.0 (2), 127.9, 127.4, 126.6, 126.5, 126.4, 126.3, 118.3, 117.6, 117.5, 115.7, 113.4, 84.3, 75.1, 50.0, 30.0, 28.8, 23.2;

HRMS (FAB) calcd m/z for $\text{C}_{27}\text{H}_{23}\text{NO}$: 377.1780 (M) $^+$. Found: 377.1779.

Example 335 methyl 2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline-10-carboxylate

Example 333A was processed as in Example 4 to provide the desired compound.
mp 150-2 $^\circ\text{C}$;

MS (DCI/ NH_3) m/z 412 ($\text{M}+\text{H}$) $^+$;

^1H NMR (300 MHz, DMSO) δ 7.36-7.30 (m, 2 H), 7.28-7.17 (m, 3 H), 7.12-7.01 (m, 2 H), 6.93-6.88 (m, 2 H), 6.84 (d, $J=8.7$ Hz, 1 H), 6.70 (d, $J=8.9$ Hz, 1 H), 6.40 (br s, 1 H), 5.40 (br s, 1 H), 3.79 (s, 3 H), 1.81 (s, 3 H), 1.26 (s, 3 H), 1.17 (s, 3 H);

^{13}C NMR (125 MHz, DMSO) δ 169.9, 151.2, 146.1, 138.3, 132.5, 130.3, 128.8 (2), 128.1, 128.0 (2), 127.7, 127.4, 127.0, 126.6, 124.9, 122.9, 119.6, 117.7, 117.5, 114.2, 75.7, 52.2, 50.0, 30.0, 28.6, 23.2;

Anal. calcd for $\text{C}_{27}\text{H}_{25}\text{NO}_3$: C, 78.81; H, 6.12; N, 3.40. Found: C, 78.84; H, 6.25; N, 3.24.

Example 336 2,5-dihydro-10-(hydroxymethyl)-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a solution of Example 335 (136 mg, 0.330 mmol) in anhydrous CH_2Cl_2 (12 mL) at -50°C was added Dibal-H (1.65 mL of a 1.0 M solution in heptane, 1.65 mmol). The resulting orange solution was warmed gradually to 0°C over a 30 min period, then was stirred at 0°C for 2 h. EtOAc (5 mL) was then added to the solution at 0°C to quench the excess Dibal-H reagent (indicated by a color change of the solution from orange to light yellow) and the reaction mixture was then treated with saturated aqueous NH_4Cl (5 mL). The reaction mixture was partitioned between EtOAc (40 mL) and saturated aqueous Rochelle's salt (sodium potassium tartrate; 35 mL) and the resulting mixture was stirred vigorously until a clear separation of layers was observed (ca. 1 h). The layers were partitioned and the aqueous layer was extracted with EtOAc (15 mL). The organics were combined and were washed with brine (10 mL) and then were dried (Na_2SO_4). Filtration and concentration gave the desired compound (116 mg, 0.302 mmol, 92%) as a colorless foamy solid.

MS (DCI/ NH_3) m/z 384 ($\text{M}+\text{H}$) $^+$;

^1H NMR (300 MHz, DMSO) δ 7.58 (d, $J=8.9$ Hz, 1 H), 7.23-7.11 (m, 5 H), 6.98 (dd, $J=8.7$, 1.7 Hz, 1 H), 6.84 (t, $J=8.7$ Hz, 1 H), 6.76 (br s, 1 H), 6.75 (d, $J=8.6$ Hz, 1 H), 6.69 (dd, $J=8.7$, 1.8 Hz, 1 H), 6.26 (br s, 1 H), 5.40 (br s, 1 H), 5.37 (dd, $J=6.0$, 4.0 Hz, 1 H), 4.65 (dd, $J=11.5$, 6.0 Hz, 1 H), 4.54 (dd, $J=11.6$, 4.4 Hz, 1 H), 1.80 (s, 3 H), 1.24 (s, 3 H), 1.17 (s, 3 H);

^{13}C NMR (125 MHz, DMSO) δ 151.0, 145.6, 139.0, 137.0, 133.1, 131.4, 128.4 (2), 128.1, 128.0 (2), 127.7, 127.6, 126.2, 124.8, 123.7, 118.6, 118.0, 116.0, 113.9, 75.1, 61.9, 49.9, 29.9, 28.7, 23.3;

Anal. calcd for $\text{C}_{26}\text{H}_{25}\text{NO}_2$: C, 81.43; H, 6.57; N, 3.65. Found: C, 81.53; H, 6.86; N, 3.41.

Example 337 2,5-dihydro-10-formyl-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a solution of Example 336 (50 mg, 0.130 mmol) in CH_2Cl_2 (6 mL) at 23°C was added a solution of tetrapropylammonium perruthenate (60 mg, 0.16 mmol) in CH_2Cl_2 (14 mL). After 15 min, the reaction mixture was filtered through a small plug of silica gel, rinsing with CH_2Cl_2 followed by 1:1 EtOAc-hexanes. The filtrate was concentrated to give a gold syrup which was purified by preparative thin layer chromatography (elution with 3% EtOAc/toluene) to afford the desired product (19 mg, 0.050 mmol, 38%) as a pale yellow foam.

MS (DCI/ NH_3) m/z 382 ($\text{M}+\text{H}$) $^+$;

^1H NMR (300 MHz, DMSO) δ 10.13 (s, 1 H), 7.31 (dd, $J=8.8$, 1.9 Hz, 1 H), 7.28-7.16 (m, 5 H), 7.12 (d, $J=8.7$ Hz, 1 H), 7.05 (dd, $J=8.7$, 2.0 Hz, 1 H), 6.95 (d, $J=8.8$ Hz, 1 H), 6.92 (br s, 1 H), 6.81 (d, $J=8.8$ Hz, 1 H), 6.59 (br s, 1 H), 5.43 (br s, 1 H), 1.85 (s, 3 H), 1.27 (s, 3 H), 1.18 (s, 3 H);

^{13}C NMR (125 MHz, DMSO) δ 191.4, 151.9, 146.8, 138.3, 133.2, 131.5, 131.4, 130.8, 128.6 (2), 128.1 (2), 128.0, 127.2, 126.6, 121.5, 121.4, 118.1, 115.5, 114.2 (2), 75.8, 50.2, 30.1, 29.0, 23.1;

HRMS (FAB) calcd m/z for $\text{C}_{26}\text{H}_{24}\text{NO}$: 382.1807 ($\text{M}+\text{H}$) $^+$. Found: 382.1816.

Example 338

2,5-dihydro-10-(methoxymethyl)-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a solution of Example 336 (22 mg, 0.057 mmol) in THF (2.0 mL) at 0 °C was added KHMDS (110 mL of a 0.5 M solution in toluene, 0.057 mmol). After 15 min, a solution of iodomethane was added as a solution in DMF (100 mL of a solution of 81 mg iodomethane in 1.0 mL DMF, 0.057 mmol) was added and the solution was stirred additionally at 0 °C for 30 min, the cooling bath was removed, and the reaction was stirred additionally at 23 °C for 1.5 h. The reaction was then quenched with water (3 mL) and was extracted with EtOAc (2 x 20 mL). The combined organic layers were washed with brine (5 mL), then were dried (MgSO_4), and were concentrated in vacuo to provide a brown oil. Purification of this residue by preparative thin layer chromatography (elution with 10% EtOAc/hexanes) afforded the desired product (15 mg, 0.038 mmol, 66%) as a colorless foam.

MS (DCI/ NH_3) m/z 98 ($\text{M}+\text{H}$) $^+$;

^1H NMR (300 MHz, DMSO) δ 7.40 (d, $J=8.9$ Hz, 1 H), 7.19-7.10 (m, 5 H), 6.97-6.92 (m, 1 H), 6.94 (s, 1 H), 6.77-6.70 (m, 3 H), 6.29 (br s, 1 H), 5.39 (br s, 1 H), 4.58 (d, $J=11.1$ Hz, 1 H), 4.39 (d, $J=11.1$ Hz, 1 H), 3.28 (s, 3 H), 1.81 (s, 3 H), 1.26 (s, 3 H), 1.17 (s, 3 H);

^{13}C NMR (125 MHz, DMSO) δ 151.0, 145.7, 138.8, 132.9, 132.6, 131.5, 128.4 (2), 127.8 (2), 127.8, 127.7, 127.5, 126.1, 125.7, 124.4, 118.3, 117.9, 116.6, 113.9, 75.2, 72.5, 57.2, 49.9, 29.9, 28.7, 23.3;

HRMS (FAB) calcd m/z for $\text{C}_{27}\text{H}_{27}\text{NO}_2$: 397.2042 (M) $^+$. Found: 397.2039.

Example 339

2,5-dihydro-10-ethenyl-5-oxo-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 3C and vinyl tributylstannane were processed as in Example 5 to provide the desired compound.
mp 218-224 °C;

MS (DCI/NH₃) m/z 318 (M+H)⁺, 335 (M+NH₄)⁺;

¹H NMR (300 MHz, DMSO) □ 7.88 (d, J=8.8 Hz, 1 H), 7.38 (dd, J=8.8, 6.6 Hz, 1 H), 7.29 (s, 1 H), 7.28 (d, J=8.6 Hz, 1 H), 7.19 (dd, J=17.3, 11.1 Hz, 1 H), 7.13 (d, J=8.7 Hz, 1 H), 7.03 (br s, 1 H), 5.75 (dd, J=17.3, 1.2 Hz, 1 H), 5.52-5.47 (m, 2 H), 1.97 (s, 3 H), 1.24 (s, 6 H);

¹³C NMR (125 MHz, CDCl₃) □ 160.1, 150.0, 145.4, 138.5, 136.3, 132.2, 131.0, 127.1, 126.7, 126.6, 125.5, 124.1, 119.9, 118.5, 117.2, 115.9, 115.7, 50.0, 27.9 (2), 21.0; Anal. calcd for C₂₁H₁₉NO₂: C, 79.47; H, 6.03; N, 4.41. Found: C, 79.28; H, 5.97; N, 4.20.

Example 340 5-(3-cyclohexenyl)-2,5-dihydro-10-ethenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a magnetically stirred solution of Example 339 (100 mg, 0.300 mmol) and 3-(trimethylsilyl)cyclohexene (139 mg, 0.900 mmol) in CH₂Cl₂ (6 mL) at -78 °C was added freshly distilled BF₃•OEt₂ (80 mL, 0.600 mmol). The resulting greenish brown solution was stirred at -78 °C for 15 min then slowly warmed to 23 °C with continued stirring over a period of 1 h. The reaction mixture was poured into 10% NaHCO₃ solution (10 mL) and extracted with EtOAc (2 x 20 mL). The combined organic portions were washed with brine (8 mL) and were dried (Na₂SO₄). Filtration and concentration gave a brown residue which was purified via flash chromatography (elution with 5% EtOAc/hexanes) to give the desired product as a tan foam (356 mg, 0.186 mmol, 62%). MS (DCI/NH₃) m/z 384 (M+H)⁺;

¹H NMR (300 MHz, DMSO) (data for major *syn* diastereomer) □ 7.30 (d, J=8.0 Hz, 1 H), 7.16-6.97 (m, 3 H), 6.95-6.88 (m, 1 H), 6.67 (d, J=8.0 Hz, 1 H), 6.42 (br s, 1 H), 5.82-5.60 (m, 3 H), 5.52-5.44 (m, 2 H), 5.33 (d, J=7.6 Hz, 1 H), 2.40-2.26 (m, 1 H), 2.17 (s, 3 H), 2.05-1.82 (m, 2 H), 1.70-1.53 (m, 2 H), 1.32 (s, 3 H), 1.31-1.07 (m, 2 H), 1.05 (s, 3 H);

¹³C NMR (125 MHz, CDCl₃) □ 138.8, 134.2, 129.3 (2), 128.1 (2), 127.9 (2), 126.7, 121.3, 116.4, 114.1, 37.2, 37.0, 34.7, 31.6, 30.2, 27.2, 26.1, 25.2, 24.7, 22.6, 24.1, 21.8 (2), 20.5, 14.1;

Anal. calcd for C₂₇H₂₉NO: C, 83.57; H, 7.66; N, 3.60. Found: C, 83.55; H, 7.38; N, 3.45.

Example 341

2,5-dihydro-10-ethenyl-5-[1-methyl-3-cyclohexenyl]-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 339 and 3-(dimethylphenylsilyl)-3-methylcyclohexene were processed as in Example 339 to provide the desired compound.

mp 198-201 °C;

MS (DCI/NH₃) *m/z* 398 (M+H)⁺;

¹H NMR (300 MHz, DMSO) (data for major *syn* diastereomer): δ 7.30 (d, *J*=7.9 Hz, 1 H), 7.16-7.00 (m, 3 H), 6.92 (dd, *J*=7.1, 2.6 Hz, 1 H), 6.66 (d, *J*=8.0 Hz, 1 H), 6.39 (br s, 1 H), 5.73 (d, *J*=12.4 Hz, 1 H), 5.52-5.41 (m, 3 H), 5.32 (d, *J*=10.2 Hz, 1 H), 2.33-2.22 (m, 1 H), 2.14 (s, 3 H), 1.91-1.70 (m, 1 H), 1.87-1.65 (m, 1 H), 1.63-1.51 (m, 1 H), 1.60 (s, 3 H), 1.34-1.15 (m, 2 H), 1.31 (s, 3 H), 1.13-0.98 (m, 1 H), 1.04 (s, 3 H);

Anal. calcd for C₂₈H₃₁NO: C, 84.59; H, 7.85; N, 3.52. Found: C, 84.46; H, 7.81; N, 3.37.

Example 342

2,5-dihydro-5-(3-propenyl)-10-methylthio-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

To a magnetically stirred solution of Example 3B (120 mg, 0.390 mmol) in anhydrous DMF (1.0 mL) at 0 °C was added sodium hydride (17 mg of a 60% dispersion in mineral oil, 0.430 mmol). The mixture was stirred under an atmosphere of nitrogen until evolution of hydrogen had ceased (1 h). Solid dimethylthiocarbamoyl chloride (64 mg, 0.520 mmol) was then introduced in a single portion and stirring was continued at 0 °C for 30 min. The cooling bath was removed and the mixture heated at 80 °C for 45 min. The reaction mixture was then poured into 1% NaOH (10 mL) and extracted with EtOAc (2 x 25 mL). The combined organics portions were washed with water (3 x 5 mL) and with brine (3 mL) then dried (MgSO₄), filtered and concentrated. The resulting brown residue was purified flash chromatography (elution with 25% EtOAc/hexanes) to provide the resulting thionocarbamate (43 mg, 0.109 mmol, 28%) as a yellow solid. MS (DCI/NH₃) *m/z* 348 (M+H)⁺.

The compound prepared above (113 mg, 0.280 mmol) was placed in an open vial and immersed in a Woods metal bath heated to 270-280 °C for 6 min. The reaction was cooled and the resulting dark brown residue was purified flash chromatography (gradient elution: 20%Æ40% EtOAc/hexanes) to provide the thermally rearranged thiocarbamate product (67 mg, 0.165 mmol, 59%) as a yellow solid. MS (DCI/NH₃) *m/z* 348 (M+H)⁺.

To a solution of the rearranged product (500 mg, 1.26 mmol) in anhydrous toluene (70 mL) at -78 °C under N₂ was added dropwise Dibal-H (2.02 mL of a 1.0 M solution in heptane, 2.02 mmol) maintaining the temperature at -78 °C. The resulting orange-red solution was stirred at -78 °C for 1.5h at which time a TLC of an aliquot (quenched with satd. ammonium chloride) indicated conversion to desired product.. Some lower R_f material (diol resulting from over-reduction) was also observed. EtOAc (10 mL) was added to the solution at -78 °C to quench the excess DIBAL-H reagent

(indicated by a color change of the solution from orange-red to light yellow), followed by addition of saturated aqueous NH_4Cl solution (15 mL). The reaction mixture was partitioned between EtOAc (150 mL) and aqueous Rochelle's salt (sodium potassium tartrate, 40 mL) and the resulting mixture was stirred vigorously until a clear separation of layers was observed. The layers were separated and the organic layer was washed with brine (20 mL), was dried (Na_2SO_4), and was filtered. Removal of solvent gave the lactol as a light yellow foam (512 mg) which was used without further purification.

The lactol was dissolved in MeOH (30 mL) at 23 ° C and *p*-TsOH· H_2O (50 mg, 25% w/w) was added portionwise as a solid. The mixture was stirred for 14 h at 23 ° C and then was quenched with saturated aqueous sodium bicarbonate (10 mL) and was extracted with EtOAc (2 x 50 mL). The organics portions were combined and were washed with brine (20 mL) and were dried (Na_2SO_4). Filtration and concentration provided a yellow residue which was purified by flash chromatography (elution with 5% EtOAc/ CH_2Cl_2) to provide the product methylacetal (157 mg, 0.416 mmol, 33% over two steps) as a yellow foam. MS (DCI/ NH_3) *m/z* 379 ($\text{M}-\text{OCH}_3$)⁺.

The lactol prepared above and allyltrimethylsilane were processed as in Example 2 to give a C-5 allyl compound. MS (DCI/ NH_3) *m/z* 421 ($\text{M}+\text{H}$)⁺.

Example 343

2,5-dihydro-5-(3-propenyl)-10-methylthio-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

A suspension of the thiocarbamate (249 mg, 0.590 mmol) and KOH (90 mg, 1.20 mmol) in ethylene glycol (6 mL) containing water (1.5 mL) was heated at reflux (homogeneous solution) for 1.5 h. The solution was cooled and poured onto ice (10 g). The mixture was acidified (pH 4) with 10% HCl and was then extracted with CH_2Cl_2 (2 x 20 mL). The extracts were dried (Na_2SO_4), were filtered, and were concentrated. The resulting residue was purified by flash chromatography (elution with 5% EtOAc/ CH_2Cl_2) to provide nearly homogeneous thiophenol adduct (183 mg) as an off-yellow solid that was used immediately: ^1H NMR (300 MHz, $\text{DMSO}-d_6$) δ 7.72 (d, *J*=8.0 Hz, 1 H), 7.08 (dd, *J*=7.6, 1.1 Hz, 1 H), 6.96 (t, *J*=7.5 Hz, 1 H), 6.67 (d, *J*=8.1 Hz, 1 H), 6.63 (dd, *J*=7.5, 1.2 Hz, 1 H), 6.28 (br s, 1 H), 5.88-5.70 (m, 2 H), 5.47 (br s, 1 H), 5.41 (s, 1H), 5.03 (dd, *J*=13.2, 1.3 Hz, 1 H), 4.98 (dd, *J*=18.4, 1.3 Hz, 1 H), 2.48-2.21 (m, 2 H), 2.17 (s, 3 H), 1.20 (s, 3 H), 1.17 (s, 3 H); MS (DCI/ NH_3) *m/e* 350 ($\text{M}+\text{H}$)⁺.

A solution of the crude thiophenol (183 mg) in DMF (10 mL) at 0 ° C was treated with cesium carbonate (50 mg, 0.153 mmol). After 10 min, a solution of iodomethane (25 mg, 0.176 mmol) in DMF (0.7 mL) was added, and the solution was stirred at 0 ° C

for 30 min then at 23 °C for 2 h. The mixture was diluted with 1:1 EtOAc-hexane (100 mL) and was washed with water (3 x 25 mL) then washed with brine (25 mL). The organic portion was dried (Na₂SO₄), was filtered, and was concentrated. The resulting residue was purified by flash chromatography (elution with 5% EtOAc/hexanes) to provide the thioether (65 mg, 0.179 mmol, 34%) as an off-yellow solid: ¹H NMR (300 MHz, DMSO-d₆) δ 7.82 (d, *J*=8.1 Hz, 1 H), 7.11 (t, *J*=7.6 Hz, 1 H), 6.98 (br d, *J*=7.7 Hz, 1 H), 6.72 (br d, *J*=7.6 Hz, 1 H), 6.62 (d, *J*=8.0 Hz, 1 H), 6.27 (br s, 1 H), 5.88-5.70 (m, 2 H), 5.47 (br s, 1 H); 5.03 (dd, *J*=13.3, 1.1 Hz, 1 H), 4.99 (dd, *J*=18.3, 1.1 Hz, 1 H), 2.47 (s, 3 H), 2.46-2.33 (m, 1 H), 2.32-2.22 (m, 1 H), 2.18 (s, 3 H), 1.21 (s, 3 H), 1.17 (s, 3 H); MS (CI/NH₃) *m/e* 364 (M+H)⁺.

Example 344 (+/-) 2,5-dihydro-9-(4-acetamidobutanoyloxy)-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) *m/z* 491 (M+H)⁺;

¹H NMR (200 MHz, DMSO-d₆) δ 7.94 (t, 1H), 7.84 (d, 1H), 6.88 (d, 1H), 6.67 (d, 1H), 6.64 (d, 1H), 6.21 (s, 1H), 5.87-5.78 (m, 2H), 5.46 (s, 1H), 5.06-4.96 (m, 2H), 2.60 (s, 2H), 2.16 (dt, 2H), 2.62 (t, 2H), 2.21-2.27 (m, 2H), 2.18 (s, 2H), 1.82 (s, 2H), 1.79 (m, 2H), 1.18 (s, 2H), 1.17 (s, 2H).

Example 345

10-(difluoromethoxy)-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 7 and bromodifluoromethane were processed as in Example 8A to provide the desired compound.

MS (CI/NH₃) *m/z* 420 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 7.80 (s, *J*=8.8 Hz, 1 H), 7.26-7.15 (m, 5 H), 7.16-7.13 (m, 1 H), 6.97 (t, *J*=8.1 Hz, 1 H), 6.82 (br s, 1 H), 6.74 (d, *J*=8.9 Hz, 1 H), 6.72-6.67 (m, 1 H), 6.38 (br s, 1 H), 5.39 (br s, 1 H), 1.82 (s, 3 H), 1.24 (s, 3 H), 1.15 (s, 3 H); HRMS (FAB) calcd *m/z* for C₂₆H₂₃F₂NO₂: 419.1697 (M)⁺. Found: 419.1714.

Example 346

10-(bromodifluoromethoxy)-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (ESI) *m/z* 498 (M+H)⁺.

¹H NMR (300 MHz, DMSO-d₆) δ 7.68 (s, *J*=8.8 Hz, 1 H), 7.25-7.14 (m, 5 H), 7.03 (t, *J*=8.2 Hz, 1 H), 6.89-6.84 (m, 1 H), 6.85 (br s, 1 H), 6.83-6.79 (m, 1 H), 6.74 (d, *J*=8.6 Hz, 1 H), 6.46 (br s, 1 H), 5.40 (br s, 1 H), 1.81 (s, 3 H), 1.25 (s, 3 H), 1.15 (s, 3 H);

^{13}C NMR (125 MHz, DMSO- d_6) $\square$ 152.34, 146.44, 145.97, 138.38, 133.02, 130.51, 128.61 (2), 128.07, 127.92 (2), 127.33, 126.86 (2), 119.16, 117.82, 116.68, 115.84, 115.32, 114.28, 114.12, 75.60, 49.93, 29.90, 28.72, 23.26;
 HRMS (FAB) calcd m/z for $\text{C}_{26}\text{H}_{22}^{79}\text{BrF}_2\text{NO}_2$: 497.0802 ($\text{M}+\text{H}$) $^+$. Found: 497.0790.
 5 HRMS (FAB) calcd m/z for $\text{C}_{26}\text{H}_{22}^{81}\text{BrF}_2\text{NO}_2$: 499.0782 ($\text{M}+\text{H}$) $^+$. Found: 499.0793.

Example 347

10-(bromodifluoromethoxy)-5-phenyl-2,2-dimethyl-4-methylene-2,3,4,5-tetrahydro-1H-chromeno[3,4-f]quinoline

10 MS (ESI) m/z 498 ($\text{M}+\text{H}$) $^+$.
 ^1H NMR (300 MHz, CDCl_3) $\square$ 7.88 (s, $J=8.4$ Hz, 1 H), 7.31-7.26 (m, 2 H), 7.19-7.12 (m, 3 H), 6.95 (t, $J=8.1$ Hz, 1 H), 6.86-6.78 (m, 2 H), 6.64 (br s, 1 H), 6.58 (d, $J=8.5$ Hz, 1 H), 4.94 (s, 1 H), 4.61 (s, 1 H), 4.17 (br s, 1 H), 2.45 (br d, $J=12.0$ Hz, 1 H), 2.19 (d, $J=12.4$ Hz, 1 H), 1.35 (s, 3 H), 1.14 (s, 3 H);
 15 HRMS (FAB) calcd m/z for $\text{C}_{26}\text{H}_{22}^{79}\text{BrF}_2\text{NO}_2$: 497.0802 ($\text{M}+\text{H}$) $^+$. Found: 497.0790.
 HRMS (FAB) calcd m/z for $\text{C}_{26}\text{H}_{22}^{81}\text{BrF}_2\text{NO}_2$: 499.0782 ($\text{M}+\text{H}$) $^+$. Found: 499.0771.

Example 348

2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-((2-fluorophenyl)methyl)-1H-[1]benzopyrano[3,4-f]quinoline

20

Example 349

10-methoxy-5-(5-methylisoxazol-3-yl)methyldene-2,5-dihydro-5-phenyl-2,2,4-trimethyl-

25

1H-[1]benzopyrano[3,4-f]quinoline

Example 1F and the lithium anion of 3,5-dimethylisoxazole were processed as in Example 1B to provide the desired compound.

MS (DCI/ NH_3) m/z 401 ($\text{M}+\text{H}$) $^+$;

30

^1H NMR (300 MHz, DMSO- d_6) $\square$ 8.33 (d, 1H, $J=8.83$ Hz), 7.7-7.5 (m, 1H), 7.22 (t, 1H, $J=8.09$), 7.05 (d, 1H, $J=1.1$ Hz), 6.85 (s, 1H), 6.79 (d, 1H, $J=8.82$ Hz), 5.61 (s, 1H), 5.5 (s, 1H), 3.93 (s, 3H), 2.45 (s, 3H), 1.96 (d, 3H, $J=1.1$ Hz), 1.20-1.30 (s, 6H).

Example 350

10-methoxy-5-(3-methylisoxazol-5-yl)methyidene-2,5-dihydro-5-phenyl-2,2,4-trimethyl-

1H-[1]benzopyrano[3,4-f]quinoline

Example 1F and the lithium anion of 3,5-dimethylisoxazole were processed as in Example 1B to provide the desired compound.

MS (DCI/NH₃) *m/z* 401 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆), isomer 1: δ 8.38 (d, 1H, J=8.83 Hz), 7.22 (t, 1H, J=8 Hz), 7.09 (s, 1H), 6.87-6.81 (m, 2H), 6.56 (s, 1H), 5.65 (s, 1H), 5.51 (s, 1H), 3.93 (s, 3H), 2.28 (s, 3H), 1.95 (s, 3H), 1.29 (s, 3H), 1.26 (s, 3H); isomer 2: δ 8.16 (d, 1H, J=8.83 Hz), 7.18 (t, 2H, J=8 Hz), 7.06 (s, 1H), 6.80-6.76 (m, 2H), 6.46 (s, 1H), 5.90 (s, 1H), 5.21 (s, 1H), 3.91 (s, 3H), 2.08 (s, 3H), 1.84 (s, 3H), 1.26 (s, 3H), 1.12 (s, 3H).

Example 351

10-methoxy-5-(4,5-dimethyl-1,3-oxazol-2-yl)methyidene-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 1F and the lithium anion of 2,4,5-trimethyloxazole were processed as in Example 1B to provide the desired compound.

MS (DCI/NH₃) *m/z* 415 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆), isomer 1: δ 8.36 (d, 1H, J=8.82 Hz), 7.24-7.20 (m, 1H), 6.82 (m, 3H), 6.25 (s, 1H), 5.49 (s, 1H), 3.92 (s, 3H), 2.31 (s, 3H), 2.09 (s, 3H), 1.28 (s, 3H), 1.2 (m, 6H); 2nd isomer: δ 8.09 (d, 1H, J=8.82 Hz), 7.16 (m, 1H), 6.78-6.73 (m, 2H), 5.41 (s, 1H), 5.21 (s, 1H), 3.91 (s, 3H), 2.03 (s, 3H), 1.89 (s, 3H), 1.88 (s, 3H), 1.25-1.15 (m, 6H).

Example 352

10-methoxy-5-(6-chloropyridin-2-yl)methyidene-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 1F and the lithium anion of 6-chloro-2-methylpyridine were processed as in Example 1B to provide the desired compound.

MS (DCI/NH₃) *m/z* 431 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.35 (d, 1H, J=4.7 Hz), 8.25 (d, 1H, J=8.1 Hz), 7.9 (t, 1H, J=7.7 Hz), 7.30 (d, 1H, J=7.7 Hz), 7.21 (d, 1H, J=8 Hz), 7.00 (d, 1H, J=8.1 Hz), 6.8 (dd, 2H, J=8.4, 2.6 Hz), 6.72 (s, 1H), 5.65 (s, 1H), 5.51 (s, 3H), 3.93 (s, 3H), 1.99 (s, 3H), 1.2 (s, 6H).

Example 35310-methoxy-5-(pyridin-2-yl)methylenide-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

5 Example 1F and the 4-picolinyl lithium were processed as in Example 1B to provide the desired compound.

MS (DCI/NH₃) *m/z* 397 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆), isomer 1: δ 8.52 (d, 2H, J=6.1 Hz), 8.17 (d, 1H, J=8.8 Hz), 7.2 (t, 1H, J=8.2 Hz), 6.96 (s, 1H), 6.7 (m, 3H), 6.66 (s, 2H), 5.55 (s, 1H), 4.53 (s, 1H), 3.93 (s, 3H), 1.81 (d, 3H, J=1.4 Hz), 1.27 (s, 6H); isomer 2: δ 8.32 (d, 2H, J=6.1 Hz), 8.19 (d, 1H, J=8.8 Hz), 7.17 (t, 1H, J=8.2 Hz), 6.99 (s, 1H), 6.77 (m, 3H), 6.45 (s, 2H), 5.48 (s, 1H), 5.05 (s, 1H), 3.93 (s, 3H), 1.81 (d, 3H, J=1.4 Hz), 1.27 (s, 6H).

Example 35410-methoxy-5-(but-3-enylidene)-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

15 Example 1F and the lithium anion of cyclopropylmethylbromide were processed as in Example 1B to provide the desired compound.

MS (DCI/NH₃) *m/z* 360 (M+H)⁺;

20 ¹H NMR (300 MHz, DMSO-d₆) δ 8.16 (d, 1H, J=8.8 Hz), 7.10 (t, 1H, J=7.7 Hz), 6.8-6.6 (m, 4H), 6.47 (s, 1H), 5.89-5.75 (m, 1H), 5.41 (s, 1H), 5.10-4.93 (m, 2H), 4.67 (t, 1H, J=7.5 Hz), 3.88 (s, 3H), 1.97 (d, 3H, J=1.3 Hz), 1.20 (s, 6H).

Example 35510-methoxy-5-(1-methylpropylidene)-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

25 Example 1F and the *sec*-butyllithium were processed as in Example 1B to provide the desired compound.

MS (DCI/NH₃) *m/z* 362 (M+H)⁺;

30 ¹H NMR (300 MHz, DMSO-d₆) δ 8.01 (d, 1H, J=8.09 Hz), 7.09 (t, 2H, J=8.09 Hz), 6.7 (dd, 2H, J=8.5, 2.6 Hz), 6.65 (d, 1H, J=8.46 Hz), 6.37 (d, 1H, J=0.8 Hz), 5.4 (s, 1H), 3.87 (s, 3H), 1.86 (d, 3H, J=1.1 Hz), 1.48 (s, 3H), 1.33 (s, 3H), 1.08 (s, 3H), 0.9 (t, 3H, J=7.3 Hz).

Example 35610-methoxy-5-(1-butyldiene)-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

5 Example 1F and the *n*-butyllithium were processed as in Example 1B to provide the desired compound.

MS (DCI/NH₃) *m/z* 362 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.14 (d, 1H), 7.07 (t, 1H), 6.67 (m, 3H), 6.07 (s, 1H),
10 5.40 (s, 1H), 4.71 (t, 1H), 3.88 (s, 3H), 2.29 (q, 1H), 2.00 (s, 3H), 1.43-1.36 (m, 2H),
1.21 (s, 6H), 0.88 (t, 3H).

Example 357 2,5-dihydro-10-methoxy-2,2,4-trimethyl-3-oxide-5-phenyl-1H-[1]benzopyrano[3,4-f]quinazolineExample 357A8-amino-7-bromo-1-methoxy-6H-benzo[c]chromen-6-one

15 A solution of Example 1E (3.0 g, 12.0 mmol) in DMF (100 mL) was treated with N-bromosuccinimide (2.2 g, 12.0 mmol), stirred for 40 minutes, poured into 900 mL of water, stirred for 5 minutes and the resulting solid was collected by filtration and dried to
20 give the desired compound.

Example 357B7-bromo-1-methoxy-6-phenyl-6H-benzo[c]chromen-8-ylamine

25 Example 357A (2.0 g, 6.25 mmol) and phenyllithium were processed as in Examples 1G and 1 to provide the desired compound.

Example 357C1-(7-bromo-1-methoxy-6-phenyl-6H-benzo[c]chromen-8-yl)ethan-1-one

30 Example 357B (1.23 g, 3.22 mmol), tributyl(1-ethoxyvinyl)tin, (1.4 g, 3.86 mmol), and dichlorobis(triphenylphosphine)palladium (II) (263 mg, 0.322 mmol) in NMP (30 mL) were heated at 85 °C for 24 hours under nitrogen. The mixture was partitioned between EtOAc and saturated aqueous sodium bicarbonate and filtered through Celite. The EtOAc layer was concentrated and the residue was dissolved in acetonitrile, washed 5 X 20 mL with hexanes and concentrated. The resulting residue
35 was treated with a 1:1 volume of 1N HCl / THF, stirred for 30 minutes, poured into cold, saturated sodium bicarbonate and extracted with EtOAc (5 X 25 mL). The organics were washed with brine, dried (Na₂SO₄) and flash chromatographed on silica eluting with 4:1 hexane/EtOAc to give the desired compound.

Example 357D1-(7-bromo-1-methoxy-6-phenyl-6H-benzo[c]chromen-8-yl)ethan-1-one oxime

A solution of Example 357C (700 mg, 2.03 mmol) and hydroxylamine hydrochloride (2.45 g, 30.4 mmol) in a mixture of EtOH (70 mL) and pyridine (70 mL) was refluxed for 8 hours, cooled and concentrated. The residue was dissolved in EtOAc, washed with water, brine, dried (Na₂SO₄) and concentrated to provide the desired compound without purification.

Example 3572,5-dihydro-10-methoxy-2,2,4-trimethyl-3-oxide-5-phenyl-1H-[1]benzopyrano[3,4-f]quinazoline

Example 357D (700 mg, 1.94 mmol), CuSO₄ (105 mg) and acetic acid (3 drops) were combined in acetone (30 mL) and refluxed for 8 hours. The mixture was cooled, poured into water and extracted with EtOAc (3 X 50 mL). The organics were combined, washed with brine, dried (Na₂SO₄) and concentrated. The residue was triturated with EtOAc (30 mL) and the yellow solid was collected by filtration to provide the desired compound.

MS (DCI/NH₃) m/z 401 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.21 (d, 1H), 7.30 (s, 1H), 7.29-7.16 (m, 5H), 7.00-6.92 (m, 2H), 6.61 (d, 1H), 6.57 (s, 1H), 6.44 (d, 1H), 3.72 (s, 3H), 2.01 (s, 3H), 1.55 (s, 3H), 1.28 (s, 3H);

HRMS calcd m/z for C₂₄H₂₇NO₂: 400.1787 (M)⁺. Found: 400.1786

Example 358 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-phenyl-1H-[1]benzopyrano[3,4-f]quinazoline

A solution of Example 357E (80 mg, 0.2 mmol) in MeOH under 4 atmospheres of hydrogen was treated with Raney nickel and stirred for 24 hours. The mixture was filtered through Celite, concentrated and the resulting residue was flash chromatographed on silica eluting with 99:1 EtOAc/MeOH to provide the desired compound.

MS (DCI/NH₃) m/z 385 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.22 (d, 1H), 7.26-7.15 (m, 5H), 6.93 (t, 1H), 6.79 (s, 1H), 6.76 (d, 1H), 6.73 (s, 1H), 6.57 (d, 1H), 6.44 (d, 1H), 3.81 (s, 3H), 2.00 (s, 3H), 1.36 (s, 3H), 1.21 (s, 3H).

HRMS calcd m/z for C₂₅H₂₄N₂O₂: 385.1916 (M+H)⁺. Found: 385.1930.

Example 359 2,5-dihydro-10-methoxy-2,2-[spiro (tetrahydro-4-pyranyl)]-4-methyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 359A

Example 357A (1.3 g, 4.08 mmol), isopropenyltrimethyltin (3.3 g, 16.3 mmol) and dichlorobis(triphenylphosphine)palladium (II) (330 mg, 0.40 mmol) in NMP (30 mL) were heated at 85 °C for 24 hours under nitrogen. The mixture was partitioned between EtOAc and saturated aqueous potassium fluoride, stirred for 3 hours and filtered through Celite. The EtOAc layer was washed 5 X 50 mL with water, 5 x 50 mL with brine, dried (Na₂SO₄) and concentrated. Flash chromatography on silica eluting with 3:1 hexane/EtOAc provided the desired product.

Example 359

A mixture of the 2-isopropenyl aniline (56 mg, 0.2 mmol), tetrahydro-4H-pyran-4-one (160 mg, 1.6 mmol) and iodine (25 mg, 0.1 mmol) in 5 mL of toluene in an ACE sealed tube was heated at 80 °C for 1 hour, cooled and the mixture was partitioned between EtOAc and 10% aqueous Na₂S₂O₃. The EtOAc layer was washed with water, brine, dried (Na₂SO₄) and concentrated. Flash chromatography on silica eluting with 3:2 hexane/EtOAc provided the desired coumarin as a bright yellow powder. This resulting coumarin was processed as in Example 2 to provide the desired compound.

MS (DCI/NH₃) m/z 390 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 7.92 (d, 1H), 7.07 (t, 1H), 6.75 (d, 1H), 6.70 (d, 1H), 6.52 (d, 1H), 6.24 (s, 1H), 5.87-5.73 (m, 2H), 5.71 (s, 1H), 5.01 (dd, 1H), 4.96 (dd, 1H), 3.86 (s, 3H), 3.75-3.39 (m, 4H), 2.51-2.14 (m, 2H), 2.20 (s, 3H), 1.69-1.49 (m, 4H); HRMS calcd m/z for C₂₅H₂₇NO₃: 389.1991 (M)⁺. Found: 389.1974.

Anal. calcd for C₂₅H₂₇NO₃: C, 77.07; H, 6.99; N, 3.60. Found: C, 76.92; H, 7.28; N, 3.64.

Example 360 2,5-dihydro-10-methoxy-2,2-[spiro(hexyl)]-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 357A was treated sequentially with isopropenyltributyltin and cyclohexanone as in the previous example to give the desired compound.

MS (DCI/NH₃) m/z 388 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) □ 7.95 (d, 1H), 7.06 (t, 1H), 6.74 (d, 1H), 6.70 (d, 1H), 6.52 (d, 1H), 6.05 (s, 1H), 5.85-5.72 (m, 2H), 5.58 (s, 1H), 5.02 (dd, 1H), 4.97 (dd, 1H), 3.86 (s, 3H), 2.42 (m, 1H), 2.18 (s, 3H), 2.16 (m, 1H), 1.56-1.25 (m, 10H);

HRMS calcd m/z for C₂₆H₂₉NO₂: 387.2198 (M)⁺. Found: 387.2196.

Example 3612,5-dihydro-10-methoxy-2,2-diethyl-4-methyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 357A was treated sequentially with isopropenyltributyltin and 3-pentanone as in the previous example to give the desired compound.

MS (DCI/NH₃) m/z 376 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 7.92 (d, 1H), 7.05 (t, J=8 Hz, 1H), 6.68 (d, 1H), 6.59 (d, 1H), 6.51 (d, 1H), 5.98 (s, 1H), 5.86-5.77 (m, 2H), 5.27 (s, 1H), 5.04-4.95 (m, 2H), 3.85 (s, 3H), 2.42 (m, 1H), 2.21 (s, 3H), 2.15 (m, 1H), 1.42-1.35 (m, 4H), 0.83 (t, 3H), 0.82 (t, 3H);

HRMS calcd m/z for C₂₅H₂₉NO₂: 375.2198 (M)⁺. Found: 375.2191.

Anal. calcd for C₂₅H₂₉NO₂: C, 79.96; H, 7.78; N, 3.73. Found: C, 79.74; H, 7.89; N, 3.54.

Example 3622,5-dihydro-10-methoxy-2,2,3,4-tetramethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 357A was treated sequentially with 1-methyl-1-propenyltributyltin and acetone as in the previous example to give the desired compound

MS (DCI/NH₃) m/z 362 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 7.97 (d, 1H), 7.07 (t, 1H), 6.70 (d, 1H), 6.62 (d, 1H), 6.53 (d, 1H), 5.90 (s, 1H), 5.76 (m, 1H), 5.61 (dd, 1H), 5.01-4.90 (m, 2H), 3.87 (s, 3H), 2.47 (m, 1H), 2.18 (m, 1H), 2.04 (s, 3H), 1.76 (s, 3H), 1.13 (s, 3H), 1.09 (s, 3H);

HRMS calcd m/z for C₂₄H₂₇NO₂: 361.2042 (M)⁺. Found: 361.2055.

Example 3632,5-dihydro-10-methoxy-2,2-dimethyl-4-ethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 357A was treated sequentially with 1-methylenepropyltributyltin and acetone as in the previous example to give the desired compound.

MS (DCI/NH₃) m/z 362 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 7.98 (d, 1H), 7.07 (t, 1H), 6.70 (dd, 1H), 6.63 (d, 1H), 6.53 (dd, 1H), 6.12 (bs, 1H), 5.78 (m, 1H), 5.59 (dd, 1H), 5.50 (bs, 1H), 5.03-4.92 (m, 2H), 3.86 (s, 3H), 2.54-2.41 (m, 3H), 2.11 (m, 1H), 1.20 (s, 3H), 1.10 (s, 3H), 1.03 (t, 3H);

HRMS calcd m/z for C₂₄H₂₇NO₂: 361.2042 (M)⁺. Found: 361.2034.

Example 3642,5-dihydro-10-methoxy-2,2,3-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

Example 357A was treated sequentially with (Z)-1-propenyltributyltin and acetone as in the previous example to give the desired compound.

MS (DCI/NH₃) m/z 348 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 7.89 (d, 1H), 7.04 (t, 1H), 6.68 (d, 1H), 6.52 (d, 1H), 6.47 (d, 1H), 6.21 (s, 1H), 5.96 (s, 1H), 5.88 (m, 1H), 5.43 (dd, 1H), 5.03 (m, 1H), 4.96 (m, 1H), 3.84 (s, 3H), 2.35 (m, 1H), 2.08 (m, 1H), 1.83 (s, 3H), 1.23 (s, 6H);

HRMS calcd m/z for C₂₃H₂₅NO₂: 347.1885 (M)⁺. Found: 347.1879.

Example 365Z-5-(benzylidenyl)-9-hydroxy-10-methoxy-2,2,4-trimethyl-1H-2,5-dihydro- MS (DCI/NH₃) 412 (M+H)⁺;

¹H NMR (300 MHz, DMSO-d₆) δ 8.93 (s, 1 H), 8.13 (d, J=8.8 Hz, 1 H), 7.63 (d, J=8.8 Hz, 2 H), 7.32-7.15 (m, 3 H), 6.77 (d, 1 H), 6.69 (d, 1 H), 6.66 (d, 1 H), 6.52 (s, 1 H), 5.46 (s, 1 H), 5.39 (s, 1 H), 3.65 (s, 3 H), 1.90 (s, 3 H), 1.20 (s, 6 H);

HRMS calcd for C₂₇H₂₅NO₃ is 411.1834. Found 411.1821.

Example 366Z-5-(2,5-difluorobenzylidenyl)-9-hydroxy-10-methoxy-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/e (M+H)⁺ 448.

¹H NMR (300 MHz, DMSO-d₆) δ 9.06 (s, 1H), 8.29 (d, J=9 Hz, 1H), 7.96 (m, 1H), 7.24 (m, 1H), 7.11 (m, 1H), 6.86 (d, J=9 Hz, 1H), 6.82 (d, J=9 Hz, 1H), 6.78 (d, J=9 Hz, 1H), 6.72 (br s, 1H), 5.75 (s, 1H), 5.48 (s, 1H), 3.75 (s, 3H), 1.99 (s, 3H), 1.26 (br s, 6H);

Anal. calcd for C₂₇H₂₃NO₃F₂: C, 72.47; H, 5.18; N, 3.13. Found: C, 72.21; H, 5.31; N, 3.09.

Example 367Z-5-(3-fluorobenzylidenyl)-10-chloro-9-hydroxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 434 (M+H)⁺;

¹H NMR (300 MHz, DMSO) δ 9.86 (br s, 1 H), 8.40 (d, J=8.5 Hz, 1 H), 7.61 (dt, J=8.6, 1.8 Hz, 1 H), 7.60-7.52 (m, 1 H), 7.46-7.38 (m, 1H), 7.15-7.02 (m, 1 H), 7.09 (d, J=8.4 Hz, 1 H), 6.85 (d, J=8.6 Hz, 1 H), 6.84 (s, 1 H), 6.78 (d, J=8.6 Hz, 1 H), 5.68 (s, 1 H), 5.48 (br s, 1 H), 1.97 (br s, 3 H), 1.16 (br s, 6 H);

^{13}C NMR (125 MHz, DMSO) δ 163.8, 160.6, 149.9, 149.2, 148.2, 146.4, 132.0, 130.3, 128.1, 127.3, 126.2, 125.3, 124.5, 118.7, 117.7, 117.3, 116.1, 115.5, 114.6, 114.3, 114.0, 113.7, 62.1, 29.8, 28.2, 21.2;
HRMS (FAB) calcd m/z for $\text{C}_{26}\text{H}_{21}\text{ClFNO}_2$: 433.1245 (M) $^{+}$. Found: 433.1237.

5

Example 368

Z-10-chloro-9-hydroxy-5-(2-picolinylidenyl)-2,2,4-trimethyl-2,5-dihydro-1H-

[1]benzopyrano[3,4-f]quinoline

MS (DCI/ NH_3) m/z 417 (M+H) $^{+}$;

10 ^1H NMR (300 MHz, DMSO) δ 9.79 (br s, 1 H), 8.51 (ddd, $J=5.9, 1.6, 1.0$ Hz, 1 H), 8.43 (d, $J=8.6$ Hz, 1 H), 8.24 (dt, $J=7.8, 1.0$ Hz, 1 H), 7.53 (td, $J=7.8, 1.7$ Hz, 1 H), 7.22 (ddd, $J=7.7, 5.8, 1.2$ Hz, 1 H), 7.00 (d, $J=8.5$ Hz, 1 H), 6.88 (d, $J=8.6$ Hz, 1 H), 6.81 (d, $J=8.5$ Hz, 1 H), 6.63 (br s, 1 H), 5.71 (s, 1 H), 5.51 (br s, 1 H), 2.00 (br s, 3 H), 1.28 (br s, 6 H);
15 ^{13}C NMR (125 MHz, DMSO- d_6) δ 153.5, 149.7, 146.4, 145.7, 136.5, 136.1, 132.7, 128.7, 128.2, 123.0, 122.4, 121.5, 118.3, 117.7, 117.6, 116.5, 115.5, 114.8, 114.4, 114.1, 113.9, 49.5, 29.7, 28.1, 21.2;
HRMS (FAB) calcd m/z for $\text{C}_{25}\text{H}_{21}\text{ClN}_2\text{O}_2$: 416.1291 (M) $^{+}$. Found: 416.1288.

Example 369

20 Z-9-hydroxy-10-methoxy-5-(2-picolinylidenyl)-2,2,4-trimethyl-2,5-dihydro-1H-

[1]benzopyrano[3,4-f]quinoline

MS (DCI/ NH_3) m/z 413 (M+H) $^{+}$;

^1H NMR (300 MHz, DMSO) δ 9.08 (br s, 1 H), 8.55 (ddd, $J=5.3, 1.4, 1.0$ Hz, 1 H), 8.32 (d, $J=8.6$ Hz, 1 H), 8.30 (br t, $J=7.7$ Hz, 1 H), 7.83 (td, $J=7.8, 1.4$ Hz, 1 H), 7.21 (ddd, $J=7.6, 5.3, 1.2$ Hz, 1 H), 6.97 (d, $J=8.6$ Hz, 1 H), 6.86 (d, $J=8.5$ Hz, 1 H), 6.81 (d, $J=8.6$ Hz, 1 H), 6.73 (br s, 1 H), 5.80 (s, 1 H), 5.54 (br s, 1 H), 3.78 (s, 3 H), 2.03 (br s, 3 H), 1.31 (br s, 6 H);
25 ^{13}C NMR (125 MHz, DMSO- d_6) δ 158.4, 149.1, 148.2, 146.6, 139.5, 136.0, 133.1, 128.8, 125.7, 124.6, 122.9, 121.0, 119.4, 118.2, 117.3, 116.9, 115.8, 115.1, 114.7, 114.0, 111.5, 73.3, 50.2, 29.9, 28.1, 22.3;
30 HRMS (FAB) calcd m/z for $\text{C}_{26}\text{H}_{25}\text{N}_2\text{O}_3$: 413.1865 (M+H) $^{+}$. Found: 413.1849.
Anal. calcd for $\text{C}_{26}\text{H}_{24}\text{N}_2\text{O}_3$: C, 75.71; H, 5.86; N, 6.79. Found: C, 75.61; H, 6.05; N, 6.75.

Example 370

9-hydroxy-10-methoxy-5-(3,5-difluorophenyl)methylidene-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 9.05 (s, 1H), 8.24 (d, J=9 Hz, 1H), 7.41 (m, 2H), 7.07 (m, 1H), 6.85 (d, J=8 Hz, 1H), 6.80 (d, J=9 Hz, 1H), 6.76 (d, J=9 Hz, 1H), 6.70 (br s, 1H), 5.57 (s, 1H), 5.46 (s, 1H), 3.72 (s, 3H), 1.96 (s, 3H), 1.27 (br s, 6H); ¹³C NMR (75 MHz, DMSO-d₆) □ 164.0 (d), 160.8 (d), 150.1, 146.2, 146.1, 144.6, 144.4, 132.1, 128.8, 125.2, 125.0, 117.9, 117.8, 115.2, 115.0, 114.8, 112.1, 110.9, 110.8, 110.5, 101.9, 101.6, 101.2, 29.3, 49.5, 21.1 (2xC); MS (DCI/NH₃) *m/e* (M+H)⁺ 448.

Example 371

9-hydroxy-10-methoxy-5-(3,4-difluorophenyl)methylidene-2,5-dihydro-5-phenyl-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 9.03 (s, 1H), 8.22 (d, J=9 Hz, 1H), 7.79 (m, 1H), 7.52 (m, 1H), 7.41 (m, 1H), 6.86 (d, J=9 Hz, 1H), 6.77 (d, J=9 Hz, 1H), 6.74 (d, J=9 Hz, 1H), 6.68 (br s, 1H), 5.53 (s, 1H), 5.45 (s, 1H), 3.33 (s, 3H), 1.95 (s, 3H), 1.27 (br s, 6H); MS (DCI/NH₃) *m/e* (M+H)⁺ 448. FAB HRMS calculated for C₂₇H₂₃NO₃F₂.

Example 372 (Z) 9-hydroxy-10-methoxy-5-((4-fluorophenyl)methylene)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 9.01 (s, 1H), 8.19 (d, J=9 Hz, 1H), 7.77 (d, J=9 Hz, 1H), 7.76 (d, J=9 Hz, 1H), 7.22 (d, J=9 Hz, 1H), 7.18 (d, J=9 Hz, 1H), 6.84 (d, J=8 Hz, 1H), 6.75 (d, J=9 Hz, 1H), 6.72 (d, J=9 Hz, 1H), 6.66 (s, 1H), 5.53 (s, 1H), 5.45 (s, 1H), 3.71 (s, 3H), 1.96 (s, 3H), 1.26 (s, 6H); ¹³C NMR (75 MHz, DMSO-d₆) □ 161.8, 159.4, 147.4, 146.0, 145.1, 144.4, 132.0, 131.4, 130.2, 130.1, 129.0, 126.2, 125.0, 117.8, 115.4, 115.3, 115.2, 114.6, 114.5, 113.3, 111.0, 59.3, 59.2, 49.5, 21.0; MS (DCI/NH₃) *m/z* 430 (M+H)⁺; Anal. calcd for C₂₇H₂₄NO₃F: C, 75.51; H, 5.63; N, 3.26. Found: C, 75.64; H, 5.97; N, 3.03.

Example 373

(Z)-9-hydroxy-10-methoxy-5-([2,3-difluorophenyl]methylene)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 9.09 (s, 1H), 8.27 (d, J=9 Hz, 1H), 8.04 (d, J=9 Hz, 1H), 7.33-7.20 (m, 2H), 6.87 (d, J=9 Hz, 1H), 6.82 (d, J=9 Hz, 1H), 6.76 (s, 1H), 6.75 (d, J=9 Hz, 1H), 5.75 (s, 1H), 5.49 (s, 1H), 3.73 (s, 3H), 1.99 (s, 3H), 1.26 (s, 6H); MS (DCI/NH₃) *m/z* 448 (M+H)⁺; Anal. calcd for C₂₇H₂₃NO₃F₂: C, 72.47; H, 5.18; N, 3.13. Found: C, 72.17; H, 5.03; N, 2.95.

Example 374Z-5-(3-fluorobenzylidenyl)-10-methoxy-9-hydroxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 9.04 (s, 1H), 8.22 (d, 1H), 7.62-7.37 (m, 3H), 7.10-7.02 (m, 1H), 6.86 (d, 1H), 6.78 (d, 1H), 6.73 (d, 1H), 6.70 (s, 1H), 5.56 (s, 1H), 5.46 (s, 1H), 3.72 (s, 3H), 1.96 (s, 3H), 1.27 (s, 3H). MS (DCI/NH₃) m/z 430 (M+H)⁺; Anal. calcd for C₂₇H₂₄NO₃F• 0.25 H₂O: C, 75.51; H, 5.63; N, 3.26. Found: C, 74.84; H, 6.17; N, 2.91.

Example 375rel-(5S,3'R)-9-hydroxy-5-[1-methoxymethyl-3-cyclohexenyl]-10-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinolineMS (DCI/NH₃) m/z 452 (M + H)⁺;

¹H NMR (300 MHz, DMSO) □ 8.02 (d, J = 8.6 Hz, 1 H), 6.93 (app s, 2 H), 6.68 (d, J = 8.3 Hz, 1 H), 6.48 (br s, 1 H), 5.52 (d, J = 10.3 Hz, 1 H), 5.42 (br s, 1 H), 5.10 (br s, 1 H), 4.46 (t, J = 5.5 Hz, 1 H), 3.81 (s, 3 H), 3.65 (br d, J = 5.5 Hz, 2 H), 2.26-2.16 (m, 1 H), 2.08 (br s, 3 H), 1.95-1.88 (m, 2 H), 1.77-1.62 (m, 2 H), 1.57-1.44 (m, 1 H), 1.37-1.28 (m, 1 H), 1.30 (s, 3 H), 1.11 (s, 3 H);

¹³C NMR (125 MHz, DMSO) □ 150.4, 146.0, 144.9, 140.7, 133.9, 132.7, 127.9, 127.0, 124.3, 119.8, 117.7, 116.7, 115.7, 115.4, 112.5, 110.7, 75.9, 65.5, 56.4, 49.6, 36.6, 29.7, 27.9, 25.9, 25.0, 24.4, 20.3;

HRMS (FAB) calcd m/z for C₂₇H₃₀ClNO₃: 451.1915 (M)⁺. Found: 451.1922.Example 3769-hydroxy-10-methoxy-5-ethyl-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (200 MHz, DMSO-d₆) □ 8.70 (s, 1H), 7.90 (d, J=8 Hz, 1H), 6.61 (m, 2H), 6.51 (d, J=8 Hz, 1H), 6.16 (br s, 1H), 5.52-5.40 (m, 2H), 2.62 (s, 2H), 2.09 (s, 2H), 1.79-1.58 (m, 1H), 1.52-1.27 (m, 1H), 1.17 (s, 2H), 1.15 (s, 2H), 0.89 (t, J=7 Hz, 2H); ¹²C NMR (75 MHz, DMSO-d₆) □ 145.8, 145.0, 142.9, 142.0, 122.5, 122.4, 127.6, 126.4, 118.0, 116.4, 116.1, 114.2, 112.5, 112.2, 75.1, 59.2, 49.7, 29.2, 28.8, 25.5, 22.8, 10.4; MS (DCI/NH₃) m/e (M+H)⁺ 252; Anal. calcd for C₂₂H₂₅NO₂•1/2H₂O: C, 72.94; H, 7.24; N, 2.92. Found: C, 72.78; H, 7.40; N, 2.74.

Example 377 (+/-) 2,5-dihydro-9-cyanomethoxy-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (200 MHz, DMSO-d₆) □ 7.92 (d, 1H), 6.95 (d, 1H), 6.66 (d, 1H), 6.62 (d, 1H), 6.26 (d, 1H), 5.86 (m, 2H), 5.45 (s, 1H), 5.12 (s, 2H), 5.00 (m, 2H), 2.69 (s, 2H), 2.42 (m, 1H), 2.26 (m, 1H), 2.17 (s, 2H), 1.18 (s, 2H), 1.17 (s, 2H).

Example 378 2,5-dihydro-9-(4-N,N-diethylamino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (400 MHz, DMSO-d₆) □ 7.78 (d, J=8.5, 1H), 6.76 (d, J=8.9, 1H), 6.60-6.55 (m, 2H), 6.18 (d, J=1.7, 1H), 5.80-5.70 (m, 2H), 5.28 (s, 1H), 4.98-4.90 (m, 2H), 2.55 (s, 2H), 2.28-2.17 (m, 4H), 2.77-2.69 (m, 2H), 2.68-2.57 (m, 2H), 2.29 (m, 1H), 2.19 (m, 1H), 2.10 (s, 2H), 1.11 (s, 2H), 1.10 (s, 2H), 1.06 (t, J=7.2, 2H), 0.95 (t, J=7.2, 2H); ¹³C NMR (100 MHz, DMSO-d₆) □ 171.5, 169.5, 148.2, 148.0, 146.2, 128.5, 124.1, 122.5, 122.1, 127.2, 126.2, 120.8, 118.2, 117.2, 116.2, 115.0, 112.8, 112.5, 72.6, 60.0, 49.8, 41.1, 26.6, 29.2, 29.0, 27.4, 22.8, 14.0, 12.1; MS (ESI/NH₃) m/e 519(M+H)⁺, 541(M+Na)⁺; Anal. Calcd for C₃₁H₃₈N₂O₅: C 71.79, H 7.28, N 5.40. Found: C 71.50, H 7.28, N 5.28.

Example 379 2,5-dihydro-9-(4-N-piperidino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (200 MHz, DMSO-d₆) □ 7.78 (d, J=8.4, 1H), 6.76 (d, J=8.8, 1H), 6.61-6.55 (m, 2H), 6.17 (d, J=1.5, 1H), 5.82-5.68 (m, 2H), 5.28 (s, 1H), 4.99-4.89 (m, 2H), 2.55 (s, 2H), 2.27 (m, 4H), 2.74 (m, 2H), 2.61 (m, 2H), 2.41 (m, 1H), 2.18 (m, 1H), 2.10 (s, 2H), 1.51-1.16 (m, 6H), 1.11 (s, 2H), 1.10 (s, 2H); ¹³C NMR (75 MHz, DMSO-d₆) □ 171.7, 168.9, 148.5, 148.2, 146.5, 128.7, 124.2, 122.8, 122.2, 127.5, 126.5, 121.0, 118.4, 117.5, 116.4, 115.2, 114.0, 112.8, 72.8, 60.2, 50.0, 45.9, 42.4, 26.8, 29.5, 29.2, 27.7, 26.1, 25.5, 24.2, 24.1; MS (ESI/NH₃) m/e 521(M+H)⁺, 552(M+Na)⁺; Anal. Calcd for C₃₂H₃₈N₂O₅: C 72.42, H 7.22, N 5.28. Found: C 72.16, H 7.26, N 5.09.

Example 380 2,5-dihydro-9-(4-N-morpholino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (400 MHz, DMSO-d₆) □ 7.78 (d, J=8.9, 1H), 6.77 (d, J=8.5, 1H), 6.60-6.55 (m, 2H), 6.18 (s, 1H), 5.80-5.70 (m, 2H), 5.28 (s, 1H), 4.98-4.90 (m, 2H), 2.55 (s, 2H), 2.52-2.42 (m, 4H), 2.40 (m, 4H), 2.76 (m, 2H), 2.65 (m, 2H), 2.40 (m, 1H), 2.20 (m, 1H), 2.10 (s, 2H), 1.11 (s, 2H), 1.10 (s, 2H); ¹³C NMR (100 MHz, DMSO-d₆) □ 171.4, 169.4, 148.2, 148.0, 146.2, 128.5, 124.1, 122.5, 122.1, 127.2, 126.2, 120.8, 118.2, 117.2, 116.2, 115.0, 112.8, 112.6, 72.6, 66.1, 60.0, 49.8, 45.1, 41.6, 26.6, 29.2, 29.0, 28.8, 27.2, 22.8; MS (ESI/NH₃) m/e 522(M+H)⁺, 555(M+Na)⁺; Anal. Calcd for C₃₁H₃₆N₂O₆: C 69.90, H 6.81, N 5.26. Found: C 69.61, H 6.84, N 5.04.

Example 381 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(3,4,5-trifluorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (400 MHz, DMSO-d₆) δ 7.90 (d, J=8.5, 1H), 7.07-7.02 (m, 2H), 6.80-6.70 (m, 2H), 6.62 (d, J=8.9, 1H), 6.44 (s, 1H), 5.42 (d, J=1.2, 1H), 2.54 (s, 2H), 2.97 (s, 2H), 2.82 (s, 2H), 2.76-2.72 (m, 2H), 2.67-2.64 (m, 2H), 1.84 (s, 2H), 1.25 (s, 2H), 1.15 (s, 2H); ¹³C NMR (100 MHz, DMSO-d₆) δ 171.4, 170.4, 150.1 (d, J=248), 148.4, 147.9, 146.4, 128.7, 128.2 (dd, J=251, 49), 126.5, 122.2, 128.2, 127.1, 126.5, 121.0, 118.5, 117.9, 116.1, 114.8, 112.0, 112.8, 112.6, 72.7, 59.7, 49.9, 26.5, 24.9, 29.7, 28.9, 28.6, 27.6, 22.2; MS (ESI/NH₃) m/e 581(M+H)⁺, 602(M+Na)⁺; Anal. Calcd for C₃₂H₃₁F₃N₂O₅: C 66.20, H 5.28, N 4.82. Found: C 66.17, H 5.46, N 4.65.

Example 382 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3,5-difluorophenylmethyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) δ 8.81 (s, 1H), 7.95 (d, J = 8 Hz, 1H), 7.10-7.03 (m, 1H), 6.78 (d, J = 9 Hz, 2H), 6.63 (dd, J = 9, 9 Hz, 2H), 6.41 (d, J = 9 Hz, 1H), 6.22 (s, 1H), 5.91 (dd, J = 10, 10 Hz, 1H), 5.40 (s, 1H), 3.69 (s, 3H), 3.06-2.98 (m, 1H), 2.90-2.84 (m, 1H), 2.19 (s, 3H), 1.15 (s, 3H), 1.12 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) δ 163.8, 163.6, 160.6, 160.4, 145.9, 145.2, 144.1, 142.6, 142.4, 142.3, 133.4, 131.7, 127.4, 126.5, 117.8, 116.5, 116.2, 114.5, 113.9, 112.3, 112.2, 111.9, 102.1, 101.7, 101.4, 73.5, 59.5, 49.7, 29.1, 29.0, 24.1; HRMS calc'd for C₂₇H₂₅O₃F₂N: m/e 449.1803, found 449.1801; Analysis calc'd for C₂₇H₂₅O₃F₂N 0.05H₂O: C, 70.73; H, 5.72; N, 3.05; found: C, 70.52; H, 5.79; N, 2.91.

Example 383 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-(2-thienyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR δ 9.51 (s, 1H), 7.95 (d, 1H, J=8.5Hz), 7.40 (dd, 1H, J=5.1Hz, J=1.4Hz), 6.82 (m, 2H), 6.71 (m, 2H), 6.61 (s, 2H), 6.26 (m, 1H), 5.40 (m, 1H), 1.92 (d, 2H, J=1.4Hz), 1.24 (s, 2H), 1.14 (s, 2H); mass spectrum (ESI) m/z: 410 (M + 1); Calcd for C₂₂H₂₀ClNO₂S: 409.0902. Found: 409.0902.

Example 384 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-cyclopentyl-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) δ 8.70 (s, 1H), 7.99 (d, J = 8 Hz, 1H), 6.63 (d, J = 9 Hz, 1H), 6.61 (d, J = 9 Hz, 1H), 6.48 (d, J = 8 Hz, 1H), 6.27 (br s, 1H), 5.45 (br s, 1H), 5.35 (d, J = 10 Hz, 1H), 3.65 (s, 3H), 2.15 (s, 3H), 2.11 - 1.97 (m, 1H), 1.62 - 1.43 (m, 4H), 1.41 - 1.26 (m, 2H), 1.30 (s, 3H), 1.21 - 1.06 (m, 2H), 1.02 (s, 3H); MS (DCI/NH₃) (M+H)⁺ 392.

Example 385 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-((2-fluorophenyl)methyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 418 (M+H)⁺.

Example 386 2,5-dihydro-9-hydroxymethyl-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinolineMS (DCI/NH₃) m/z 378 (M+H)⁺;

¹H NMR (500 MHz, DMSO) □ 7.93 (d, J = 8.2 Hz, 1 H), 7.16 (d, J = 8.3 Hz, 1 H), 6.67 (d, J = 8.1 Hz, 1 H), 6.63 (d, J = 8.3 Hz, 1 H), 6.27 (br s, 1 H), 5.87-5.75 (m, 2 H), 5.44 (br s, 1 H), 5.03 (br d, J = 10.3 Hz, 1 H), 4.98 (br d, J = 15.1 Hz, 1 H), 4.97-4.93 (m, 1 H), 4.57-4.48 (m, 2 H), 3.59 (s, 3 H), 2.55-2.46 (m, 1 H), 2.30-2.22 (m, 1 H), 2.19 (s, 3 H), 1.19 (s, 3 H), 1.16 (s, 3 H);

¹³C NMR (125 MHz, DMSO) □ 154.0, 150.2, 145.9, 134.2, 133.4, 132.1, 128.9, 127.4, 126.6, 125.9, 117.2, 116.8, 116.3, 115.6, 113.9, 112.6, 73.6, 60.0, 58.1, 49.8, 36.4, 29.4, 28.9, 23.9;

HRMS (FAB) calcd m/z for C₂₄H₂₇NO₃: 377.1991 (M)⁺. Found: 377.1985.Example 387 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(1-pentenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.67 (s, 1H), 7.88 (d, J = 9 Hz, 1H), 6.59 (d, J = 9 Hz, 2H), 6.48 (d, J = 8 Hz, 1H), 6.14 (s, 1H), 5.73-5.65 (m, 1H), 5.61-5.57 (m, 1H), 5.43 (s, 1H), 4.94-4.86 (m, 2H), 3.63 (s, 3H), 2.15 (s, 3H), 1.99-1.93 (m, 2H), 1.73-1.69 (m, 1H), 1.45-1.41 (m, 3H), 1.16 (s, 6H); ¹³C NMR (75 MHz, DMSO-d₆) □ 145.7, 144.9, 143.9, 143.0, 138.4, 133.4, 133.3, 127.5, 126.4, 117.9, 116.2, 116.1, 114.7, 114.2, 113.4, 112.1, 73.5, 59.3, 49.7, 32.5, 31.7, 29.1, 28.9, 24.6, 23.8; MS calc'd for C₂₅H₂₉O₃N: m/e 391.2147, found 391.2153; Analysis calc'd for C₂₅H₂₉O₃N 0.50 H₂O: C, 74.97; H, 7.55; N, 3.50; found: C, 75.20; H, 7.45; N, 3.49.

Example 388 2,5-dihydro-9-methylcarboxylate-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinolineMS (DCI/NH₃) m/z 406 (M+H)⁺;

¹H NMR (125 MHz, DMSO) □ 7.92 (d, J = 8.1 Hz, 1 H), 6.48 (d, J = 8.3 Hz, 1 H), 6.75 (d, J = 8.2 Hz, 1 H), 6.65 (d, J = 8.2 Hz, 1 H), 6.33 (br s, 1 H), 5.90-5.75 (m, 2 H), 5.46 (br s, 1 H), 5.04 (dd, J = 10.5, 1.0 Hz, 1 H), 4.98 (dd, J = 15.4, 1.0 Hz, 1 H), 3.82 (s, 3 H), 3.67 (s, 3 H), 2.54-2.42 (m, 1 H), 2.38-2.27 (m, 1 H), 2.18 (s, 3 H), 1.19 (s, 3 H), 1.16 (s, 3 H);

¹³C NMR (300 MHz, DMSO) □ 166.1, 156.5, 154.6, 146.3, 133.9, 133.5, 131.9, 129.0, 127.2, 126.2, 119.1, 118.1, 117.4, 116.2, 114.5, 114.0, 113.0, 74.0, 60.7, 51.8, 49.8, 36.8, 29.4, 29.0, 23.8;

HRMS (FAB) calcd m/z for C₂₅H₂₇NO₄: 405.1940 (M)⁺. Found: 405.1939.Example 389 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-allenyl-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.67 (s, 1H), 7.93 (d, J = 9 Hz, 1H), 6.57 (dd, J = 10, 9 Hz, 2H), 6.48 (d, J = 9 Hz, 1H), 6.15-6.12 (m, 2H), 5.41 (s, 1H), 5.31 (q, J = 12 Hz,

1H), 4.72-4.69 (m, 1H), 4.59-4.49 (m, 1H), 3.58 (s, 3H), 2.14 (s, 3H), 1.23 (s, 3H), 1.10 (s, 3H); MS calc'd for C₂₃H₂₃O₃N: m/e 361.1678, found 361.1671; Analysis calc'd for C₂₃H₂₃O₃N 0.5 H₂O: C, 74.58; H, 6.53; N, 3.78; found: C, 74.98; H, 6.56; N, 3.83.

Example 390 (-) (5S, 3'S) 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(cyclopenten-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.05 (d, J = 9 Hz, 1H), 7.09 (t, J = 8 Hz, 1H), 6.72 (d, J = 8 Hz, 1H), 6.66 (d, J = 9 Hz, 1H), 6.58 (d, J = 8 Hz, 1H), 6.19 (s, 1H), 5.77 (dd, J = 6.3 Hz, 1H), 5.50 (d, J = 10 Hz, 1H), 5.43 (s, 1H), 5.19 (dd, J = 6, 2 Hz, 1H), 3.87 (s, 3H), 2.90 (m, 1H), 2.43-2.15 (m, 2H), 2.09 (s, 3H), 1.97-1.70 (m, 2H), 1.31 (s, 3H), 1.09 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) □ 156.2, 151.4, 145.2, 133.7, 132.5, 131.6, 130.0, 128.1, 127.2, 127.1, 117.0, 116.4, 113.4, 113.1, 110.0, 105.3, 75.9, 55.6, 49.5, 48.6, 31.6, 29.7, 27.3, 27.2, 24.2; (DCI/NH₃) m/z 374 (M+H)⁺; MS (FAB HRMS) calc'd for C₂₅H₂₇NO₂: m/e 373.2042, found: 373.2047.

Example 391 (-) (5S, 3'S) 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(cyclohexen-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.03 (d, J = 9 Hz, 1H), 7.07 (t, J = 8 Hz, 1H), 6.68 (d, J = 8 Hz, 1H), 6.63 (d, J = 9 Hz, 1H), 6.57 (d, J = 8 Hz, 1H), 6.15 (s, 1H), 5.62 (m, 1H), 5.54 (m, 1H), 5.46 (s, 1H), 5.09 (m, 1H), 3.85 (s, 3H), 2.29 (m, 1H), 2.10 (s, 3H), 1.95-1.80 (m, 2H), 1.72-1.50 (m, 2H), 1.38-1.10 (m, 2H), 1.28 (s, 3H), 1.05 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) □ 156.2, 151.0, 145.0, 133.7, 130.4, 129.1, 128.1, 127.1, 126.1, 117.9, 116.5, 113.5, 113.1, 110.1, 105.4, 75.3, 55.6, 49.5, 36.8, 29.7, 27.3, 25.5, 24.6, 24.3, 20.0; MS (DCI/NH₃) m/z 388 (M+H)⁺; MS (FAB HRMS) calc'd for C₂₆H₂₉NO₂: m/e 387.2198, found: 387.2204.

[α]_D²³ = -138° (c 0.114, CHCl₃).

Example 392 (-) (5S, 3'R) 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(cyclohexen-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.05 (d, J = 9 Hz, 1H), 7.06 (t, J = 8 Hz, 1H), 6.67 (d, J = 8 Hz, 1H), 6.64 (d, J = 9 Hz, 1H), 6.59 (d, J = 8 Hz, 1H), 6.19 (s, 1H), 5.82 (m, 1H), 5.72 (m, 1H), 5.41 (s, 1H), 5.40 (d, J = 10 Hz, 1H), 3.87 (s, 3H), 2.29 (m, 1H), 2.13 (s, 3H), 1.95-1.80 (m, 2H), 1.72-1.50 (m, 2H), 1.38-1.10 (m, 2H), 1.30 (s, 3H), 1.02 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) □ 156.3, 151.4, 145.0, 133.8, 130.0, 128.3, 127.9, 127.5, 127.1, 126.9, 118.5, 116.4, 113.4, 113.0, 110.2, 105.3, 76.1, 55.6, 49.4, 37.1, 29.6, 26.8, 24.7, 23.6, 21.2; ; MS (DCI/NH₃) m/z 388 (M+H)⁺; ; MS (FAB HRMS) calc'd for C₂₆H₂₉NO₂: m/e 387.2198, found: 387.2206.

[α]_D²³ = -147° (c 0.080, CHCl₃).

Example 393 (-) (5S, 3'R) 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(cyclopenten-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.07 (d, *J* = 9 Hz, 1H), 7.08 (t, *J* = 8 Hz, 1H), 6.70 (d, *J* = 8 Hz, 1H), 6.66 (d, *J* = 9 Hz, 1H), 6.61 (d, *J* = 8 Hz, 1H), 6.22 (s, 1H), 5.82-5.70 (m, 2H), 5.48 (d, *J* = 13 Hz, 1H), 5.41 (d, *J* = 10 Hz, 1H), 3.88 (s, 3H), 2.92 (m, 1H), 2.30 (m, 1H), 2.20 (m, 1H), 2.15 (s, 3H), 1.50-1.40 (m, 2H), 1.33 (s, 3H), 1.05 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) □ 156.3, 151.8, 145.1, 133.8, 132.0, 131.8, 130.8, 127.9, 127.0, 117.7, 117.0, 116.5, 113.4, 113.3, 112.9, 109.9, 105.2, 105.0, 76.3, 49.3, 48.4, 32.4, 31.6, 26.7, 24.6, 23.9, 23.6; MS (DCI/NH₃) *m/z* 374 (M+H)⁺; MS (FAB HRMS) calc'd for C₂₅H₂₇NO₂: *m/e* 373.2042, found: 373.2049.

Example 394 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3(Z)-pentenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.71 (s, 1H), 7.92 (d, *J* = 8 Hz, 1H), 6.62 (d, *J* = 9 Hz, 1H), 6.60 (d, *J* = 9 Hz, 1H), 6.47 (d, *J* = 9 Hz, 1H), 6.18 (br s, 1H), 5.63 (dd, *J* = 4, 9 Hz, 1H), 5.43 (br s, 1H), 5.36 (m, 2H), 3.64 (s, 3H), 2.44 - 2.33 (m, 1H), 2.33 - 2.19 (m, 1H), 2.15 (s, 3H), 1.70 (m, 2H), 1.16 (s, 6H), 0.75 (t, *J* = 8 Hz, 3H); MS (DCI/NH₃) (M+H)⁺ 392.

Example 395 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-acetoxyphenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) *m/z* 458 (M+H)⁺;

¹H NMR (400 MHz, DMSO-d₆) 8.62(s, 1H), 7.92(d, 1H), 7.27(t, 1H), 7.12(d, 1H), 6.94(dd, 1H), 6.82(s, 1H), 6.72(d, 1H), 6.67(s, 1H), 6.44(d, 1H), 6.27(d, 1H), 6.20(s, 1H), 5.29(s, 1H), 2.55(s, 2H), 2.18(s, 2H), 1.81(s, 2H), 1.25(s, 2H), 1.12(s, 2H).

Example 396 10-difluoromethoxy-5-[[3-(methylthio)methoxy]phenyl]-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 496 (M+H)⁺;

¹H NMR (200 MHz, DMSO-d₆) □ 7.80 (d, *J* = 8.5 Hz, 1H), 7.21 (t, *J*_{H-F} = 56 Hz, 1H), 7.20-7.12 (m, 2H), 6.99 (t, 1H), 6.82-6.68 (m, 7H), 6.29 (d, *J* = 1.1 Hz, 1H), 5.40 (s, 1H), 5.14 (s, 2H), 2.08 (s, 2H), 1.85 (s, 2H), 1.22 (s, 2H), 1.16 (s, 2H);

HRMS calcd for C₂₈H₂₇NO₂F₂S is 495.1680. Found 495.1682.

Example 397 2,5-dihydro-7-bromo-9-hydroxy-10-chloro-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) *m/z* 448 (M+H)⁺;

¹H NMR (300 MHz, DMSO) □ 10.03 (s, 1H), 7.90 (d, *J* = 8.5 Hz, 1H), 7.00 (app s, 2H), 6.63 (d, *J* = 8.4 Hz, 1H), 6.43 (br s, 1H), 5.92-5.77 (m, 2H), 5.47 (br s, 1H), 5.11-4.97 (m, 1H), 2.44-2.26 (m, 2H), 2.19 (s, 3H), 1.22 (s, 3H), 1.18 (s, 3H);

^{13}C NMR (125 MHz, DMSO- d_6) $\square$ 156.7, 150.2, 148.6, 144.0, 139.1, 136.3, 135.5, 130.8, 129.2, 124.4, 117.6, 115.9, 115.2, 114.0, 111.6, 75.9, 51.6, 48.3, 35.5, 29.8, 27.9, 24.0;

HRMS (FAB) calcd m/z for $\text{C}_{22}\text{H}_{21}^{77}\text{BrClNO}_2$: 445.0444 (M) $^+$. Found: 445.0436.

HRMS (FAB) calcd m/z for $\text{C}_{22}\text{H}_{21}^{79}\text{BrClNO}_2$: 447.0424 (M) $^+$. Found: 447.0413.

Anal. Calcd for $\text{C}_{22}\text{H}_{21}\text{BrClNO}_2$: C, 59.15; H, 4.74; N, 3.14. Found: C, 59.31; H, 4.85; N, 3.22.

Example 398 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-hydroxyphenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH $_3$) m/z 416(M+H) $^+$;

^1H NMR (400 MHz, DMSO- d_6) 9.22(s, 1H), 8.56(s, 1H), 7.92(d, 1H), 6.98(t, 1H), 6.71(d, 1H), 6.64(d, 1H), 6.58(m, 2H), 6.54(dd, 1H), 6.44(d, 1H), 6.22(d, 1H), 6.22(s, 1H), 5.27(s, 1H), 2.56(s, 2H), 1.82(s, 2H), 1.24(s, 2H), 1.12(s, 2H).

Example 399 2,5-dihydro-9-methylthiomethoxy-10-methoxy-2,2,4-trimethyl-5-(3-(methylthio)methoxyphenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH $_3$) m/z 526(M+H) $^+$

^1H NMR (400 MHz, DMSO- d_6) 7.94(d, 1H), 7.14(t, 1H), 6.82-6.70(m, 6H), 6.50(d, 1H), 6.24(s, 1H), 5.29(s, 1H), 5.16(s, 2H), 5.14(s, 2H), 2.61(s, 2H), 2.14(s, 2H), 2.08(s, 2H), 1.82(s, 2H), 1.24(s, 2H), 1.16(s, 2H).

Example 400 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-(methylthiomethoxy)phenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH $_3$) m/z 476(M+H) $^+$;

^1H NMR (400 MHz, DMSO- d_6) 8.58(s, 1H), 7.92(d, 1H), 7.12(t, 1H), 6.82-6.671(m, 4H), 6.62(s, 1H), 6.42(d, 1H), 6.26(d, 1H), 6.25(s, 1H), 5.28(s, 1H), 5.12(s, 2H), 2.55(s, 2H), 2.07(s, 2H), 1.84(s, 2H), 1.22(s, 2H), 1.15(s, 2H).

Example 401 9-hydroxy-10-chloro-5-(phenylmethylene)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

^1H NMR $\square$ 9.48 (s, 1H), 7.98 (m, 1H), 7.42 (m, 1H), 7.22 (m, 5H), 7.00 (m, 1H), 6.71 (m, 1H), 6.52 (m, 1H), 6.42 (m, 1H), 5.47 (m, 0.5H), 5.12 (m, 0.5H), 1.96 (s, 2H), 1.02 (s, 2H), 0.85 (s, 2H); mass spectrum (DCI) m/z: 416 (M + 1); Calcd for $\text{C}_{26}\text{H}_{22}\text{ClNO}_2$: 415.1229. Found: 415.1229.

Example 402 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-([2-N,N-dimethylcarbamoyloxy]phenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH $_3$) 504(M+NH $_4$) $^+$, 487(M+H) $^+$;

^1H NMR (400 MHz, DMSO- d_6) 8.59(s, 1H), 7.92(d, 1H), 7.22(t, 1H), 7.09(d, 1H), 6.91(dd, 1H), 6.81(t, 1H), 6.72(d, 1H), 6.66(d, 1H), 6.44(d, 1H), 6.24(d, 1H), 6.27(s,

1H), 5.28(s, 1H), 2.55(s, 2H), 2.949s, 2H), 2.82(s, 2H), 1.81(s, 1H), 1.24(s, 2H), 1.12(s, 2H).

Example 403 2,5-dihydro-9-N,N-dimethylcarbamoyloxy-10-methoxy-2,2,4-trimethyl-

5 5-([2-N,N-dimethylcarbamoyloxy]phenyl)-1H-[1]benzopyrano[3,4-f]quinoline
MS (DCI/NH₃) 575(M+MH₄)⁺; 1H NMR (400 MHz, DMSO-d₆) 7.90(d, 1H), 7.25(t, 1H), 7.11(d, 1H), 6.95(dd, 1H), 6.85(s, 1H), 6.79(s, 1H), 6.75(d, 1H), 6.71(d, 1H), 6.52(d, 1H), 6.49(s, 1H), 5.41(s, 1H), 2.52(s, 2H), 2.02(s, 2H), 2.94(s, 2H), 2.89(s, 2H), 2.85(s, 2H), 1.84(s, 2H), 1.25(s, 2H), 1.15(s, 2H).

Example 404 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-ethyl-1H-

[1]benzopyrano[3,4-f]quinoline

10 ¹H NMR (300 MHz, DMSO-d₆) □ 9.59 (s, 1H), 7.91 (d, *J* = 8 Hz, 1H), 6.75 (s, 2H), 6.62 (d, *J* = 8 Hz, 1H), 6.29 (d, *J* = 2 Hz, 1H), 5.46 (m, 2H), 2.14 (s, 3H), 1.57 (m, 2H), 1.19 (s, 3H), 1.15 (s, 3H), 0.89 (t, *J* = 7 Hz, 3H); Hi Res MS (APCI) *m/e* calc'd for C₂₁H₂₂NO₂Cl: 355.1339, found 355.1353.

Example 405 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-isopropyl-1H-

[1]benzopyrano[3,4-f]quinoline

15 ¹H NMR (300 MHz, DMSO-d₆) □ 9.57 (s, 1H), 8.02 (d, *J* = 8 Hz, 1H), 6.76 (s, 2H), 6.65 (d, *J* = 9 Hz, 1H), 6.45 (s, 1H), 5.45 (s, 1H), 5.32 (d, *J* = 9 Hz, 1H), 2.17 (s, 3H), 1.70 (m, 1H), 1.30 (s, 3H), 1.02 (s, 3H), 0.92 (d, *J* = 6 Hz, 3H), 0.67 (d, *J* = 6 Hz, 3H);
20 HRMS(APCI) *m/e* calc'd for C₂₂H₂₄NO₂Cl: 369.1496, found 369.1492.

Example 406 9-hydroxy-10-methoxy-5-(phenylmethylene)-2,2,4-trimethyl-1H-2,5-

dihydro- [1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 412 (M+H)⁺;

25 ¹H NMR (200 MHz, DMSO-d₆) □ 8.92 (s, 1 H), 8.12 (d, *J* = 8.8 Hz, 1 H), 7.62 (d, *J* = 8.8 Hz, 2 H), 7.22-7.15 (m, 2 H), 6.77 (d, 1 H), 6.69 (d, 1 H), 6.66 (d, 1 H), 6.52 (s, 1 H), 5.46 (s, 1 H), 5.29 (s, 1 H), 2.65 (s, 2 H), 1.90 (s, 2 H), 1.20 (s, 6 H);
HRMS calcd for C₂₇H₂₅NO₂ is 411.1824. Found 411.1821.

Example 407 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-butyl-1H-

[1]benzopyrano[3,4-f]quinoline

30 ¹H NMR (300 MHz, DMSO-d₆) □ 9.55 (br s, 1H), 7.91 (d, *J* = 9 Hz, 1H), 6.74 (s, 2H), 6.61 (d, *J* = 8 Hz, 1H), 6.26 (d, *J* = 1 Hz, 1H), 5.56 (dd, *J* = 11, 2 Hz, 1H), 5.45 (br s, 1H), 2.15 (m, 3H), 1.64 (m, 1H), 1.46 (m, 1H), 1.31 (m, 4H), 1.19 (s, 3H), 1.15 (s, 3H), 0.78 (t, *J* = 7 Hz, 3H); MS (DCI/NH₃) *m/e* (M+H)⁺ 384.

Example 408 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(1-thiazol-2-yl)-

1H-[1]benzopyrano[3,4-f]quinoline

35 ¹H NMR (300 MHz, DMSO-d₆) □ 8.72 (s, 1H), 8.02 (d, *J* = 8 Hz, 1H), 6.88 (s, 1H), 6.70 (d, *J* = 8 Hz, 1H), 6.68 (d, *J* = 8 Hz, 1H), 6.61 (d, *J* = 9 Hz, 1H), 6.54 (s, 1H), 6.20 (s, 1H), 5.49 (s, 1H), 3.72 (s, 3H), 2.57 (s, 3H), 2.30 (s, 3H), 1.33 (s, 3H), 1.14 (s, 3H); ¹³C

NMR (75 MHz, DMSO- d_6) δ 182.9, 182.5, 181.3, 179.8, 169.8, 167.9, 165.5, 163.8, 154.6, 154.4, 153.6, 151.7, 151.3, 150.0, 127.0, 96.8, 87.2, 67.6, 65.7, 60.3; MS (DCI/NH₃) (M+H)⁺ 322.

Example 409 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-(2-methylpropyl)-

1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO- d_6) δ 9.59 (br s, 1H), 7.91 (d, J = 9 Hz, 1H), 6.75 (d, J = 8 Hz, 1H), 6.73 (d, J = 8 Hz, 1H), 6.62 (d, J = 8 Hz, 1H), 6.28 (d, J = 2 Hz, 1H), 5.70 (dd, J = 12, 2 Hz, 1H), 5.45 (br s, 1H), 2.17 (s, 3H), 1.68 (m, 2H), 1.23 (m, 2H), 1.19 (s, 3H), 1.15 (s, 3H), 0.98 (d, J = 6 Hz, 3H), 0.75 (d, J = 7 Hz, 3H); MS (DCI/NH₃) m/e (M+H)⁺ 384.

Example 410 2,5-dihydro-9-hydroxymethyl-10-chloro-2,2,4-trimethyl-5-allyl-1H-

[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 381 (M)⁺;

¹H NMR (500 MHz, DMSO) δ 7.91 (d, J = 8.4 Hz, 1 H), 7.30 (d, J = 8.5 Hz, 1 H), 6.90 (d, J = 8.4 Hz, 1 H), 6.64 (d, J = 8.5 Hz, 1 H), 6.32 (br s, 1 H), 5.90-5.73 (m, 2 H), 5.47 (br s, 1 H), 5.28 (t, J = 5.1 Hz, 1 H), 5.04 (dd, J = 10.2, 1.1 Hz, 1 H), 4.97 (dd, J = 10.2, 1.1 Hz, 1 H), 4.64-4.50 (m, 2 H), 2.46-2.25 (m, 2 H), 2.17 (br s, 3 H), 1.21 (s, 3 H), 1.16 (s, 3 H);

HRMS (FAB) calcd m/z for C₂₃H₂₄ClNO₂: 381.1496 (M)⁺. Found: 381.1495.

Example 411 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-propyl-1H-

[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO- d_6) δ 9.55 (s, 1H), 7.90 (d, J = 9 Hz, 1H), 6.74 (s, 2H), 6.60 (d, J = 9 Hz, 1H), 6.26 (s, 1H), 5.59 (d, J = 9 Hz, 1H), 5.45 (s, 1H), 2.15 (s, 3H), 1.65 (m, 1H), 1.38 (m, 3H), 1.19 (s, 3H), 1.15 (s, 3H), 0.82 (t, J = 7 Hz, 3H); ¹³C NMR (75 MHz, DMSO- d_6) δ 148.6, 146.1, 143.6, 134.8, 133.4, 127.4, 127.0, 123.9, 116.2, 115.9, 115.9, 115.2, 113.9, 112.5, 73.9, 49.8, 33.4, 29.4, 28.8, 23.8, 18.7, 13.4; Hi Res MS (APCI) m/e calc'd for C₂₂H₂₄NO₂Cl: 369.1496, found 369.1504.

Example 412 9-hydroxy-10-methoxy-5-([3-fluorophenyl]methylene)-2,2,4-trimethyl-

1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

¹H NMR (200 MHz, DMSO- d_6) δ 9.04 (s, 1H), 8.22 (d, 1H), 7.62-7.27 (m, 2H), 7.10-7.02 (m, 1H), 6.86 (d, 1H), 6.78 (d, 1H), 6.72 (d, 1H), 6.70 (s, 1H), 5.56 (s, 1H), 5.46 (s, 1H), 2.72 (s, 2H), 1.96 (s, 2H), 1.27 (s, 2H). MS (DCI/NH₃) m/z 420 (M+H)⁺; Anal. calcd for C₂₇H₂₄NO₂F• 0.25 H₂O: C, 75.51; H, 5.62; N, 2.26. Found: C, 74.84; H, 6.17; N, 2.91.

Example 413 9-hydroxy-10-chloro-5-([2-pyridyl]methylene)-2,2,4-trimethyl-1H-2,5-

dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 417 (M+H)⁺;

¹H NMR (200 MHz, DMSO) δ 9.79 (br s, 1 H), 8.51 (ddd, $J=5.9, 1.6, 1.0$ Hz, 1 H), 8.42 (d, $J=8.6$ Hz, 1 H), 8.24 (dt, $J=7.8, 1.0$ Hz, 1 H), 7.52 (td, $J=7.8, 1.7$ Hz, 1 H), 7.22 (ddd, $J=7.7, 5.8, 1.2$ Hz, 1 H), 7.00 (d, $J=8.5$ Hz, 1 H), 6.88 (d, $J=8.6$ Hz, 1 H), 6.81 (d, $J=8.5$ Hz, 1 H), 6.62 (br s, 1 H), 5.71 (s, 1 H), 5.51 (br s, 1 H), 2.00 (br s, 2 H), 1.28 (br s, 6 H);
¹³C NMR (125 MHz, DMSO- d_6) δ 152.5, 149.7, 146.4, 145.7, 126.5, 126.1, 122.7, 128.7, 128.2, 122.0, 122.4, 121.5, 118.2, 117.7, 117.6, 116.5, 115.5, 114.8, 114.4, 114.1, 112.9, 49.5, 29.7, 28.1, 21.2;
IRMS (FAB) calcd m/z for $C_{25}H_{21}ClN_2O_2$: 416.1291 (M)⁺. Found: 416.1288.

Example 414 rel-(5S)-9-hydroxy-5-[(3S)-(1-hydroxymethyl)cyclohexen-3-yl]-10-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (200 MHz, DMSO- d_6) δ 8.49 (s, 1 H), 7.99 (d, $J=8.5$ Hz, 1 H), 6.64 (d, $J=8.5$ Hz, 1 H), 6.58 (d, $J=8.5$ Hz, 1 H), 6.47 (d, $J=8.5$ Hz, 1 H), 6.21 (br s, 1 H), 5.99 (br s, 1 H), 5.40 (br s, 1 H), 5.26-5.21 (m, 1 H), 4.81-4.72 (m, 2 H), 4.02-4.02 (m, 1 H), 2.61-2.58 (m, 1 H), 2.52 (s, 2 H), 2.00-2.95 (m, 1 H), 2.21 (s, 2 H), 1.61-1.40 (m, 4 H), 1.22 (s, 2 H), 1.28-1.24 (m, 2 H), 1.04 (s, 2 H);
Anal. calcd for $C_{27}H_{21}NO_4$: C, 74.80; H, 7.21; N, 2.22. Found: C, 74.77; H, 7.15; N, 2.12.

Example 415 rel-(5S)-9-hydroxy-5-[(3S)-(1-methoxycarbonyl)cyclohexen-3-yl]-10-methoxy-2,2,4-trimethyl-2,5-dihydro-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 462 (M+H)⁺;
¹H NMR (200 MHz, DMSO- d_6) δ 8.72 (s, 1 H), 8.04 (d, $J=8.5$ Hz, 1 H), 6.90-6.87 (m, 1 H), 6.67 (d, $J=8.5$ Hz, 1 H), 6.64 (d, $J=8.5$ Hz, 1 H), 6.52 (d, $J=8.5$ Hz, 1 H), 6.25-6.29 (m, 1 H), 5.50-5.44 (m, 2 H), 4.06-4.00 (m, 1 H), 2.66 (s, 2 H), 2.62 (s, 2 H), 2.20-2.27 (m, 1 H), 2.18-2.05 (m, 1 H), 2.12 (s, 2 H), 1.72-1.60 (m, 2 H), 1.25-1.24 (m, 2 H), 1.20 (s, 2 H), 1.04 (s, 2 H);
HRMS calcd for $C_{28}H_{21}NO_5$ is 461.2202. Found 461.2196.
Anal. calcd for $C_{28}H_{21}NO_5 \cdot 0.25 H_2O$: C, 72.15; H, 6.81; N, 2.00. Found: C, 72.06; H, 7.06; N, 2.82.

Example 416 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3,5-dichlorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

MS DCI m/z 468 (M+H)⁺;
¹H NMR (200 MHz, DMSO) δ 8.69 (s, 1 H), 7.96 (d, $J=8.8$ Hz, 1 H), 7.44 (t, $J=1.8$ Hz, 1 H), 7.17 (d, $J=1.8$ Hz, 2 H), 6.76 (d, $J=8.4$ Hz, 1 H), 6.70 (s, 1 H), 6.48 (d, $J=8.8$ Hz, 1 H), 6.28 (d, $J=8.8$ Hz, 1 H), 6.25 (d, $J=1.5$ Hz, 1 H), 5.41 (s, 1 H), 2.57 (s, 2 H), 1.82 (s, 2 H), 1.25 (s, 2 H), 1.14 (s, 2 H); ¹³C NMR (200 MHz, DMSO) δ 145.9, 145.2, 142.6, 142.1, 122.7, 122.0, 128.8, 127.6, 127.2, 127.1, 126.6, 118.2, 117.9, 117.2, 114.5, 112.2, 72.7, 59.0, 49.8, 29.6, 28.2, 22.2.
HRMS calcd for $C_{26}H_{23}Cl_2FNO_3$ is 467.1066. Found 467.1064.

Example 417 (-)-(5S,3'S) 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-(1-methylcyclohexen-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 422 (M + H)⁺;

¹H NMR (300 MHz, DMSO) □ 9.55 (s, 1 H), 8.02 (d, J = 8.4 Hz, 1 H), 6.77 (app s, 2 H), 6.68 (d, J = 8.4 Hz, 1 H), 6.41 (br s, 1 H), 5.50-5.42 (m, 2 H), 4.88 (br s, 1 H), 2.23-2.15 (m, 1 H), 2.07 (br s, 3 H), 1.91-1.80 (m, 2 H), 1.76-1.63 (m, 2 H), 1.60-1.46 (m, 1 H), 1.50 (br s, 3 H), 1.38-1.28 (m, 1 H), 1.30 (s, 3 H), 1.09 (s, 3 H);

¹³C NMR (125 MHz, DMSO) □ 148.6, 145.7, 143.7, 135.8, 133.7, 132.6, 128.2, 126.8, 123.7, 120.2, 117.7, 115.9 (2), 115.3, 114.1, 112.4, 75.6, 49.5, 36.3, 29.6, 29.3, 27.5, 25.1, 24.2, 23.7, 20.2;

HRMS (FAB) calcd m/z for C₂₆H₂₈ClNO₂: 421.1809 (M)⁺. Found: 421.1810.

Example 418 (-) (5S,3'R) 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-(1-methylcyclohexen-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 422 (M + H)⁺;

¹H NMR (300 MHz, DMSO) □ 9.58 (s, 1 H), 8.05 (d, J = 8.4 Hz, 1 H), 6.79 (ABq, J = 8.0 Hz, Δn_{AB} = 14.4 Hz, 2 H), 6.67 (d, J = 8.3 Hz, 1 H), 6.47 (br s, 1 H), 5.49-5.46 (m, 2 H), 5.35 (d, J = 8.9 Hz, 1 H), 2.28-2.15 (m, 1 H), 2.12 (br s, 3 H), 1.93-1.80 (m, 1 H), 1.78-1.63 (m, 2 H), 1.64-1.51 (m, 1 H), 1.62 (br s, 3 H), 1.31 (s, 3 H), 1.25-1.13 (m, 2 H), 1.04 (s, 3 H);

¹³C NMR (125 MHz, DMSO) □ 148.7, 145.8, 144.2, 135.1, 134.0, 132.1, 127.9, 126.7, 123.7, 121.4, 118.0, 116.0 (2), 115.4, 114.2, 112.4, 103.4, 76.4, 49.5, 37.1, 29.5, 27.2, 24.5, 23.8 (2), 21.6;

HRMS (FAB) calcd m/z for C₂₆H₂₈ClNO₂: 421.1809 (M)⁺. Found: 421.1816.

Example 419 (+) (5R,3'S) 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-(1-methylcyclohexen-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

[α]_D²⁵ +237.8 ° (c = 0.5, CHCl₃);

MS (DCI/NH₃) m/z 422 (M + H)⁺;

¹H NMR (300 MHz, DMSO) □ 9.58 (s, 1 H), 8.05 (d, J = 8.4 Hz, 1 H), 6.79 (ABq, J = 8.0 Hz, Δn_{AB} = 14.4 Hz, 2 H), 6.67 (d, J = 8.3 Hz, 1 H), 6.47 (br s, 1 H), 5.49-5.46 (m, 2 H), 5.35 (d, J = 8.9 Hz, 1 H), 2.28-2.15 (m, 1 H), 2.12 (br s, 3 H), 1.93-1.80 (m, 1 H), 1.78-1.63 (m, 2 H), 1.64-1.51 (m, 1 H), 1.62 (br s, 3 H), 1.31 (s, 3 H), 1.25-1.13 (m, 2 H), 1.04 (s, 3 H);

¹³C NMR (125 MHz, DMSO) □ 148.7, 145.8, 144.2, 135.1, 134.0, 132.1, 127.9, 126.7, 123.7, 121.4, 118.0, 116.0 (2), 115.4, 114.2, 112.4, 103.4, 76.4, 49.5, 37.1, 29.5, 27.2, 24.5, 23.8 (2), 21.6;

HRMS (FAB) calcd m/z for C₂₆H₂₈ClNO₂: 421.1809 (M)⁺. Found: 421.1806.

Example 420 (+) (5R,3'R)-2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-(1-methylcyclohexen-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

$[\alpha]_D^{25} +147.5^\circ$ (c = 0.2, CHCl₃);

MS (DCI/NH₃) m/z 422 (M + H)⁺;

¹H NMR (300 MHz, DMSO) δ 9.55 (s, 1 H), 8.02 (d, J = 8.4 Hz, 1 H), 6.77 (app s, 2 H), 6.68 (d, J = 8.4 Hz, 1 H), 6.41 (br s, 1 H), 5.50-5.42 (m, 2 H), 4.88 (br s, 1 H), 2.23-2.15 (m, 1 H), 2.07 (br s, 3 H), 1.91-1.80 (m, 2 H), 1.76-1.63 (m, 2 H), 1.60-1.46 (m, 1 H), 1.50 (br s, 3 H), 1.38-1.28 (m, 1 H), 1.30 (s, 3 H), 1.09 (s, 3 H);

¹³C NMR (125 MHz, DMSO) δ 148.6, 145.7, 143.7, 135.8, 133.7, 132.6, 128.2, 126.8, 123.7, 120.2, 117.7, 115.9 (2), 115.3, 114.1, 112.4, 75.6, 49.5, 36.3, 29.6, 29.3, 27.5, 25.1, 24.2, 23.7, 20.2;

HRMS (FAB) calcd m/z for C₂₆H₂₈ClNO₂: 421.1809 (M)⁺. Found: 421.1794.

Example 421 (+/-) 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-butanoyloxy)-10-chloro-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (ESI) m/z 495 (M+H)⁺;

¹H NMR (200 MHz, DMSO-d₆) δ 7.90 (d, 1H), 6.99 (d, 1H), 6.92 (d, 1H), 6.64 (d, 1H), 6.42 (s, 1H), 5.81-5.76 (m, 2H), 5.48 (s, 1H), 5.07-4.94 (m, 2H), 2.99 (s, 2H), 2.84 (s, 2H), 2.82-2.68 (m, 4H), 2.41-2.27 (m, 2H), 2.18 (s, 2H), 1.20 (s, 2H), 1.17 (s, 2H).

Example 422 (-) 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-cyclopentyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 296(M+H)⁺;

¹H NMR (400 MHz, DMSO-d₆) δ 9.50 (bs, 1H), 8.04 (s, 1H), 6.77 (d, 1H), 6.72 (d, 1H), 6.65 (d, 1H), 6.42 (d, 1H), 5.50 (s, 1H), 5.42 (d, 1H), 2.18-1.08 (m, 18H).

Example 423 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(1-methylethyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (400 MHz, DMSO-d₆) δ 7.92 (d, J=8.5, 1H), 6.83 (d, J=8.5, 1H), 6.71-6.65 (m, 2H), 6.31 (d, J=1.7, 1H), 5.46 (br m, 1H), 5.37 (d, J=9.7, 1H), 3.61 (s, 3H), 3.00 (s, 3H), 2.84 (s, 3H), 2.80 (m, 2H), 2.70 (m, 2H), 2.17 (s, 3H), 1.80 (m, 1H), 1.31 (s, 3H), 1.03 (s, 3H), 0.95 (d, J=6.4, 3H), 0.65 (d, J=6.8, 3H); ¹³C NMR (125 MHz, DMSO-d₆) δ 171.5, 170.4, 149.0, 148.0, 145.6, 138.3, 133.6, 131.0, 127.9, 125.8, 120.7, 118.2, 118.2, 115.4, 113.4, 112.1, 78.0, 60.0, 49.4, 36.4, 34.9, 30.9, 29.6, 28.9, 27.6, 27.3, 23.8, 19.4, 17.8; MS (ESI/NH₃) m/e 493(M+H)⁺, 515(M+Na)⁺; HRMS calcd m/z for C₂₉H₂₆N₂O₅: 492.2624. Found: 492.2613.

Example 424 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-butanoyloxy)-10-methoxy-5-(phenylmethyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (500 MHz, DMSO-d₆) δ 7.90 (d, J=8.8, 1H), 7.29-7.26 (m, 2H), 7.21 (m, 1H), 7.09 (d, J=7.0, 2H), 6.89 (d, J=8.8, 1H), 6.66 (d, J=8.8, 1H), 6.60 (d, J=8.8, 1H),

6.25 (d, J=1.8, 1H), 5.98 (dd, J=10.1, 2.5, 1H), 5.42 (s, 1H), 2.67 (s, 2H), 2.01 (s, 2H), 2.97 (m, 1H), 2.85 (s, 2H), 2.84-2.81 (m, 2H), 2.72-2.69 (m, 2H), 2.22 (s, 2H), 1.17 (s, 2H), 1.14 (s, 2H); ¹³C NMR (125 MHz, DMSO-d₆) □ 171.5, 170.4, 148.2, 148.1, 146.2, 128.4, 127.6, 122.4, 121.9, 128.9, 128.2, 127.2, 126.2, 126.2, 120.8, 118.2, 116.2, 115.2, 112.9, 112.6, 74.8, 60.1, 49.7, 28.2, 24.9, 29.2, 29.1, 28.9, 27.6, 24.2; MS (ESI/NH₃) m/e 541(M+H)⁺, 562(M+Na)⁺; Anal. Calcd for C₃₃H₃₆N₂O₅: C 72.21, H 6.71, N 5.18. Found: C 72.87, H 6.97, N 4.90.

Example 425 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-thienyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (500 MHz, DMSO-d₆) □ 7.90 (d, J=8.4, 1H), 7.40 (dd, J=5.0, 1.3, 1H), 6.96 (s, 1H), 6.86 (m, 1H), 6.80 (m, 1H), 6.74-6.71 (m, 2H), 6.57 (d, J=8.4, 1H), 6.32 (d, J=1.8, 1H), 5.41 (s, 1H), 3.58 (s, 3H), 2.98 (s, 3H), 2.83 (s, 3H), 2.77-2.74 (m, 2H), 2.68-2.65 (m, 2H), 1.95 (d, J=1.1, 3H), 1.23 (s, 3H), 1.15 (s, 3H); ¹³C NMR (125 MHz, DMSO-d₆) □ 171.1, 170.2, 148.6, 147.5, 146.0, 142.8, 138.4, 132.8, 130.1, 128.0, 127.2, 126.3, 126.1, 125.9, 125.8, 120.4, 118.4, 116.8, 115.8, 114.3, 112.3, 70.9, 59.5, 49.7, 36.2, 34.7, 29.5, 28.7, 28.5, 27.4, 22.8; MS (ESI/NH₃) m/e 533(M+H)⁺, 555(M+Na)⁺; Anal. Calcd for C₂₀H₂₂N₂O₅S: C 67.65, H 6.06, N 5.26. Found: C 67.48, H 6.16, N 5.07.

Example 426 2,5-dihydro-9-(4-N,N-dimethylaminobutanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (500 MHz, DMSO-d₆) □ 7.85 (d, J=8.4, 1H), 6.86 (d, J=8.4, 1H), 6.68-6.61 (m, 2H), 6.25 (d, J=1.5, 1H), 5.86-5.78 (m, 2H), 5.46 (s, 1H), 5.06-4.98 (m, 2H), 2.61 (s, 2H), 2.62 (t, J=7.1, 2H), 2.47 (m, 1H), 2.22 (t, J=7.0, 2H), 2.25 (m, 1H), 2.18 (s, 2H), 2.16 (s, 6H), 1.80 (m, 2H), 1.18 (s, 2H), 1.17 (s, 2H); ¹³C NMR (125 MHz, DMSO-d₆) □ 171.8, 148.4, 147.9, 146.2, 128.5, 124.0, 122.5, 122.1, 127.2, 126.2, 120.7, 118.2, 117.2, 116.2, 115.0, 112.8, 112.6, 72.6, 59.9, 58.0, 45.1, 26.6, 21.1, 29.2, 29.0, 22.8, 22.5; MS (ESI/NH₃) m/e 477(M+H)⁺; Anal. Calcd for C₂₉H₃₆N₂O₄: C 72.08, H 7.61, N 5.88. Found: C 72.77, H 7.74, N 5.64.

Example 427 9-(2-ethoxy-2-oxo-ethylaminocarbonyl)-oxy-10-methoxy-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 510 (M+NH₄)⁺, 492 (M+H)⁺, 264;

¹H NMR (200 MHz, DMSO-d₆) □ 8.21 (t, J=6.0 Hz, 1 H), 7.86 (d J=8.5 Hz, 1 H), 6.86 (d, J=8.5 Hz, 1 H), 6.64 (d, J=8.5 Hz, 1 H), 6.62 (d, J=8.5 Hz, 1 H), 6.29 (d, J=1.1 Hz, 1 H), 5.90-5.76 (m, 2 H), 5.45 (br s, 1 H), 5.04 (dd, J=10.2, 1.8 Hz, 1 H), 4.99 (dd, J=17.2, 1.8 Hz, 1 H), 4.12 (q, J=7.0 Hz, 2 H), 2.85 (d, J=6.0 Hz, 2 H), 2.65 (s, 2 H), 2.20-2.22 (m, 2 H), 2.17 (d, J=1.1 Hz, 2 H), 1.21 (t, J=7.0 Hz, 2 H), 1.18 (s, 2 H), 1.17 (s, 2 H); Anal. calcd for C₂₈H₂₂N₂O₆: C, 68.28; H, 6.55; N, 5.69. Found: C, 67.97; H, 6.59; N, 5.62.

Example 428 (+/-) 2,5-dihydro-9-(3-acetamido-propanoyloxy)-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 477 (M+H)+;

¹H NMR (200 MHz, DMSO-d₆) □ 8.04 (t, 1H), 7.85 (d, 1H), 6.90 (d, 1H), 6.68 (d, 1H), 6.64 (d, 1H), 6.26 (s, 1H), 5.87-5.77 (m, 2H), 5.46 (s, 1H), 5.04 (dd, 1H), 4.98 (dd, 1H), 2.61 (s, 2H), 2.40 (q, 2H), 2.76 (t, 2H), 2.52-2.44 (m, 1H), 2.20-2.24 (m, 1H), 2.18 (s, 2H), 1.84 (s, 2H), 1.18 (s, 2H), 1.17 (s, 2H).

Example 429 (+/-) 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-benzyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 418(M+H)+;

¹H NMR (400 MHz, DMSO-d₆) ¹H NMR (200 MHz, DMSO-d₆) □ 9.70 (bs, 1H), 7.99 (s, 1H), 7.20-7.08 (m, 5H), 6.79 (d, 1H), 6.67 (d, 1H), 6.62 (d, 1H), 6.19 (d, 1H), 5.86 (dd, 1H), 5.44 (s, 1H) 2.98-2.84 (m, 2H), 2.22 (s, 2H), 1.19 (s, 2H), 1.17 (s, 2H).

Example 430 9-hydroxy-10-methoxy-5-(phenylmethylene)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

(DCI/NH₃) 412 (M + H)+;

¹H NMR (300 MHz, DMSO-d₆) □ 8.93 (s, 1 H), 8.13 (d, J = 8.8 Hz, 1 H), 7.63 (d, J = 8.8 Hz, 2 H), 7.32 - 7.15 (m, 3 H), 6.77 (d, 1 H), 6.69 (d, 1 H), 6.66 (d, 1 H), 6.52 (s, 1 H), 5.46 (s, 1 H), 5.39 (s, 1 H), 3.65 (s, 3 H), 1.90 (s, 3 H), 1.20 (s, 6 H);
HRMS calcd for C₂₇H₂₅NO₃ is 411.1834, found 411.1821.

Example 431 9-(dimethylaminothiocarbonyl)-oxy-10-methoxy-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 451 (M+H)+;

¹H NMR (200 MHz, DMSO-d₆) □ 7.84 (d J=8.8 Hz, 1 H), 6.80 (d, J=8.8 Hz, 1 H), 6.65 (d, J=8.8 Hz, 1 H), 6.62 (d, J=8.8 Hz, 1 H), 6.26 (d, J=1.7 Hz, 1 H), 5.90-5.76 (m, 2 H), 5.46 (br s, 1 H), 5.04 (dd, J=10.2, 1.8 Hz, 1 H), 4.98 (dd, J=17.2, 1.8 Hz, 1 H), 2.64 (s, 2 H), 2.29 (s, 2 H), 2.26 (s, 2 H), 2.22-2.22 (m, 2 H), 2.18 (d, J=1.7 Hz, 2 H), 1.18 (s, 2 H), 1.16 (s, 2 H);

Anal. calcd for C₂₆H₂₀N₂O₂S.0.5 H₂O: C, 67.94; H, 6.79; N, 6.09. Found: C, 68.06; H, 6.80; N, 6.12.

Example 432 (+/-) 2,5-dihydro-9-(N-carbamoyl-2-aminoacetoxy)-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 464 (M+H)+;

¹H NMR (200 MHz, DMSO-d₆) □ 7.78 (d, 1H), 6.79 (d, 1H), 6.60 (d, 1H), 6.57 (d, 1H), 6.27 (t, 1H), 6.18 (bs, 1H), 5.80-5.70 (m, 2H), 5.67 (s, 2H), 5.28 (s, 1H), 4.97 (dd, 1H), 4.92 (dd, 1H), 4.01 (d, 2H), 2.55 (s, 2H), 2.42-2.27 (m, 1H), 2.22-2.16 (m, 1H), 2.10 (s, 2H), 1.11 (s, 2H), 1.10 (s, 2H).

Example 433 (+/-) 2,5-dihydro-9-(4-ethoxy-4-oxo-butoxy)-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (200 MHz, DMSO-d₆) δ 7.92 (d, 1H, J=8Hz), 6.79 (d, 1H), 6.62 (d, 1H, J=8Hz), 6.58 (d, 1H, J=8Hz), 6.18 (d, 1H, J=2Hz), 5.82 (m, 1H), 5.72 (dd, 1H, J=2Hz, J=9Hz), 5.45 (s, 1H), 5.05-4.97 (m, 2H), 4.08 (q, 2H, J=5Hz), 4.02-2.91 (m, 2H), 2.70 (s, 2H), 2.50 (t, 2H, J=5Hz), 2.45 (m, 1H), 2.21 (m, 1H), 2.16 (s, 2H), 2.00 (quin, 2H, J=5Hz), 1.19 (t, 2H, J=5Hz), 1.17 (s, 6H).

Example 434 (+/-) 2,5-dihydro-9-(4-oxo-pentanoyloxy)-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 462 (M+H)⁺;

¹H NMR (200 MHz, DMSO-d₆) δ 7.78 (d, 1H), 6.77 (d, 1H), 6.59 (d, 1H), 6.57 (d, 1H), 6.18 (s, 1H), 5.80-5.68 (m, 2H), 5.28 (s, 1H), 4.96 (dd, 1H), 4.92 (dd, 1H), 2.54 (s, 2H), 2.79 (dd, 2H), 2.70 (dd, 2H), 2.41-2.16 (m, 2H), 2.10 (s, 2H), 2.09 (s, 2H), 1.11 (s, 2H), 1.10 (s, 2H).

Example 435 2,5-dihydro-9-hydroxy-10-chloro-2,2,4-trimethyl-5-(3,4,5-trifluorophenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR δ 9.20 (s, 1H), 7.91 (d, 1H, J=8.5Hz), 6.92 (m, 2H), 6.88 (m, 2H), 6.57 (d, 1H, J=8.5Hz), 6.28 (m, 1H), 5.45 (m, 1H), 1.81 (s, 2H), 1.29 (s, 2H), 1.09 (s, 2H); mass spectrum (DCI) m/z: 458 (M + 1); Calcd for C₂₅H₁₉ClF₃NO₂: 457.1056. Found: 457.1054.

Example 436 2,5-dihydro-9-methylthiomethoxy-10-methoxy-2,2,4-trimethyl-5-allyl-1H-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) m/z 424 (M+H)⁺;

¹H NMR (400 MHz, DMSO-d₆) δ 7.92 (d, 1H), 6.88 (d, 1H), 6.62 (d, 1H), 6.60 (d, 1H), 6.20 (s, 1H), 5.81 (m, 1H), 5.74 (dd, 1H), 5.45 (s, 1H), 5.24 (s, 1H), 5.02 (d, 1H), 4.99 (d, 1H), 2.70 (s, 2H), 2.45 (m, 2H), 2.22 (s, 2H), 2.18 (s, 2H), 1.18 (s, 2H), 1.17 (s, 2H).

Example 437 2,5-dihydro-9-(4-N,N-diethylamino-4-oxo-pentanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (400 MHz, DMSO-d₆) δ 7.84 (d, J=8.5, 1H), 6.88 (d, J=8.9, 1H), 6.68-6.62 (m, 2H), 6.26 (br s, 1H), 5.85-5.77 (m, 2H), 5.45 (br s, 1H), 5.05-4.97 (m, 2H), 3.60 (s, 3H), 3.34-3.21 (m, 4H), 2.65 (t, J=7.4, 2H), 2.45-2.41 (m, 3H), 2.27 (m, 1H), 2.17 (s, 3H), 1.90 (m, 2H), 1.18 (s, 3H), 1.17 (s, 3H), 1.12 (t, J=7.0, 3H), 1.02 (t, J=7.2, 3H); ¹³C NMR (100 MHz, DMSO-d₆) δ 171.7, 170.3, 148.4, 147.9, 146.3, 138.4, 134.0, 133.5, 132.1, 127.3, 126.1, 120.7, 118.2, 117.2, 116.2, 114.9, 113.8, 112.6, 73.6, 59.9, 49.8, 41.2, 36.6, 32.7, 30.9, 29.3, 29.0, 23.8, 20.4, 14.2, 13.1; MS (ESI/NH₂) m/e 533 (M+H)⁺, 555 (M+Na)⁺; Anal. Calcd for C₂₂H₄₀N₂O₅: C 72.15, H 7.57, N 5.26. Found: C 72.16, H 7.76, N 5.06.

Example 438 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-pentanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

1H NMR (400 MHz, DMSO-d₆) δ 7.77 (d, J=8.5, 1H), 6.81 (d, J=8.9, 1H), 6.61-6.56 (m, 2H), 6.19 (d, J=1.7, 1H), 5.80-5.70 (m, 2H), 5.28 (s, 1H), 4.98-4.90 (m, 2H), 2.71 (s, 2H), 2.90 (s, 2H), 2.76 (s, 2H), 2.58 (t, J=7.4, 2H), 2.28-2.25 (m, 2H), 2.20 (m, 1H), 2.10 (s, 2H), 1.84 (m, 2H), 1.11 (s, 2H), 1.10 (s, 2H); 13C NMR (100 MHz, DMSO-d₆) δ 171.7, 171.2, 148.4, 147.9, 146.2, 128.4, 124.1, 122.5, 122.1, 127.2, 126.2, 120.7, 118.2, 117.2, 116.2, 114.9, 112.8, 112.6, 72.6, 59.9, 49.8, 26.6, 24.8, 22.8, 21.2, 29.2, 29.0, 22.8, 20.2; MS (ESI/NH₃) m/e 505(M+H)⁺, 527(M+Na)⁺; Anal. Calcd for C₃₀H₃₆N₂O₅: C 71.40, H 7.19, N 5.55. Found: C 71.20, H 7.19, N 5.29.

Example 439 2,5-dihydro-9-(4-N-piperidino-4-oxo-pentanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

1H NMR (400 MHz, DMSO-d₆) δ 7.78 (d, J=8.9, 1H), 6.81 (d, J=8.5, 1H), 6.61-6.55 (m, 2H), 6.19 (d, J=1.7, 1H), 5.80-5.70 (m, 2H), 5.28 (s, 1H), 4.98-4.90 (m, 2H), 2.52 (s, 2H), 2.25 (m, 4H), 2.58 (t, J=7.2, 2H), 2.29-2.25 (m, 2H), 2.20 (m, 1H), 2.10 (s, 2H), 1.82 (m, 2H), 1.51 (m, 2H), 1.42 (m, 2H), 1.26 (m, 2H), 1.11 (s, 2H), 1.10 (s, 2H); 13C NMR (100 MHz, DMSO-d₆) δ 171.7, 169.6, 148.4, 147.9, 146.2, 128.4, 124.0, 122.5, 122.1, 127.2, 126.1, 120.7, 118.2, 117.2, 116.2, 114.9, 112.8, 112.6, 72.6, 59.9, 49.8, 45.8, 41.9, 26.6, 22.8, 21.2, 29.2, 29.0, 26.0, 25.2, 24.0, 22.8, 20.4; MS (ESI/NH₃) m/e 545(M+H)⁺, 567(M+Na)⁺; Anal. Calcd for C₃₃H₄₀N₂O₅: C 72.77, H 7.40, N 5.14. Found: C 72.50, H 7.42, N 4.99.

Example 440 2,5-dihydro-9-(4-N-morpholino-4-oxo-pentanoyloxy)-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline

1H NMR (400 MHz, DMSO-d₆) δ 7.77 (d, J=8.5, 1H), 6.81 (d, J=8.5, 1H), 6.61-6.56 (m, 2H), 6.19 (s, 1H), 5.78-5.70 (m, 2H), 5.28 (s, 1H), 4.98-4.90 (m, 2H), 2.52 (s, 2H), 2.50 (m, 4H), 2.29 (t, J=4.7, 4H), 2.59 (t, J=7.4, 2H), 2.41-2.27 (m, 2H), 2.20 (m, 1H), 2.10 (s, 2H), 1.82 (m, 2H), 1.11 (s, 2H), 1.10 (s, 2H); 13C NMR (100 MHz, DMSO-d₆) δ 171.6, 170.2, 148.4, 147.9, 146.2, 128.4, 124.0, 122.5, 122.1, 127.2, 126.1, 120.7, 118.2, 117.2, 116.2, 114.9, 112.8, 112.6, 72.6, 66.1, 60.0, 49.8, 45.2, 41.4, 26.6, 22.7, 21.0, 29.2, 29.0, 22.8, 20.2; MS (ESI/NH₃) m/e 547(M+H)⁺, 569(M+Na)⁺; Anal. Calcd for C₃₂H₃₈N₂O₆: C 70.21, H 7.01, N 5.12. Found: C 69.99, H 7.06, N 4.91.

Example 441 (-) 2,5-dihydro-9-(4-N,N-dimethylamino-4-oxo-butanoyloxy)-10-methoxy-2,2,4-trimethyl-5(S)-(3(S)-1-cyclopenten-3-yl)-1H-[1]benzopyrano[3,4-f]quinoline

MS (APCI) m/z 517 (M+H)⁺;

¹H NMR (200 MHz, DMSO-d₆) □ 7.94 (d, 1H), 6.84 (d, 1H), 6.69 (d, 1H), 6.67 (d, 1H), 6.22 (s, 1H), 5.75 (dd, 1H), 5.52 (d, 1H), 5.42 (s, 1H), 5.17 (dd, 1H), 2.62 (s, 2H), 2.99 (s, 2H), 2.90-2.85 (m, 1H), 2.84 (s, 2H), 2.80 (t, 2H), 2.68 (t, 2H), 2.29-2.21 (m, 1H), 2.25-2.12 (m, 1H), 2.08 (s, 2H), 1.92-1.74 (m, 2H), 1.20 (s, 2H), 1.08 (s, 2H).

Example 442 10-methoxy-9-(allylaminocarbonyl)oxy-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 464 (M+NH₄)⁺, 447 (M+H)⁺, 264.

¹H NMR (200 MHz, DMSO-d₆) □ 7.96 (t, J=5.9 Hz, 1 H), 7.86 (d, J=8.5 Hz, 1 H), 6.86 (d, J=8.5 Hz, 1 H), 6.62 (d, J=8.5 Hz, 2 H), 6.28 (d, J=1.5 Hz, 1 H), 5.90-5.76 (m, 2 H), 5.45 (br s, 1 H), 5.27-4.97 (m, 4 H), 2.71 (m, 1 H), 2.64 (s, 2 H), 2.41-2.22 (m, 2 H), 2.17 (d, J=1.5 Hz, 2 H), 1.18 (s, 2 H), 1.17 (s, 2 H);

Anal. calcd for C₂₇H₂₀N₂O₄ · 0.25 H₂O: C, 71.89; H, 6.81; N, 6.21. Found: C, 72.18; H, 7.08; N, 5.98.

Example 443 10-methoxy-9-(cyclohexylaminocarbonyl)-oxy-5-(3-propenyl)-2,2,4-trimethyl-1H-2,5-dihydro-[1]benzopyrano[3,4-f]quinoline

MS (DCI/NH₃) 506 (M+NH₄)⁺, 489 (M+H)⁺, 264.

¹H NMR (200 MHz, DMSO-d₆) □ 7.86 (d J=8.8 Hz, 1 H), 7.67 (d, J=7.8 Hz, 1 H), 6.84 (d, J=8.8 Hz, 1 H), 6.62 (d, J=8.8 Hz, 1 H), 6.61 (d, J=8.8 Hz, 1 H), 6.25 (d, J=1.0 Hz, 1 H), 5.90-5.76 (m, 2 H), 5.45 (br s, 1 H), 5.04 (dd, J=10.2, 1.8 Hz, 1 H), 4.99 (dd, J=17.2, 1.8 Hz, 1 H), 4.02 (br s, 1 H), 2.62 (s, 2 H), 2.20-2.22 (m, 2 H), 2.17 (d, J=1.0 Hz, 2 H), 1.86-1.52 (m, 5 H), 1.21-1.22 (m, 5 H), 1.18 (s, 2 H), 1.17 (s, 2 H);

HRMS calcd for C₂₀H₂₆N₂O₄ is 488.2675. Found 488.2670.

Example 444 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(3-thienyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.57 (s, 1H), 7.91 (d, J = 9 Hz, 1H), 7.35 (dd, J = 5, 5 Hz, 1H), 6.99 (d, J = 5 Hz, 1H), 6.92 (s, 1H), 6.68 (d, J = 9 Hz, 1H), 6.64 (s, 1H), 6.44 (d, J = 9 Hz, 1H), 6.34 (d, J = 9 Hz, 1H), 6.21 (s, 1H), 5.38 (s, 1H), 3.57 (s, 3H), 1.87 (s, 3H), 1.23 (s, 3H), 1.13 (s, 3H); ¹³C NMR (125 MHz, DMSO-d₆) □ 183.2, 182.4, 181.4, 181.1, 170.3, 168.8, 165.3, 165.2, 164.1, 163.9, 163.5, 163.4, 162.6, 155.8, 154.7, 151.6, 149.6, 108.9, 96.6, 87.3, 67.3, 66.0, 60.6; MS (DCI/NH₃) (M+H)⁺406.

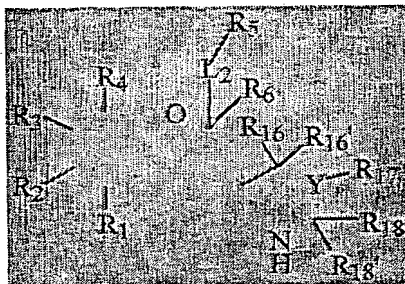
Example 445 2,5-dihydro-9-hydroxy-10-methoxy-2,2,4-trimethyl-5-(4-(fluorophenyl)methyl)-1H-[1]benzopyrano[3,4-f]quinoline

¹H NMR (300 MHz, DMSO-d₆) □ 8.47 (s, 1H), 7.94 (d, J = 8 Hz, 1H), 7.33-7.31 (m, 1H), 7.13-7.04 (m, 3H), 6.62 (dd, J = 9, 8 Hz, 2H), 6.41 (d, J = 9 Hz, 1H), 6.41 (s, 1H), 5.82 (dd, J = 10, 9 Hz, 1H), 5.40 (s, 1H), 3.69 (s, 3H), 3.01-2.93 (m, 1H), 2.81-2.76 (m, 1H), 2.20 (s, 1H), 1.15 (s, 3H), 1.13 (s, 3H); ¹³C NMR (75 MHz, DMSO-d₆) □ 162.5, 159.2, 145.8, 145.1, 144.0, 142.8, 134.1, 133.4, 132.2, 130.8, 130.7, 127.4, 126.4, 117.9,

116.4, 116.2, 115.0, 114.7, 114.4, 113.8, 112.5, 74.4, 59.5, 49.7, 37.1, 29.2, 29.0, 24.3;
MS: calc'd for $C_{27}H_{26}O_3NF$: m/e 431.1897, found 431.1905; Analysis calc'd for
 $C_{27}H_{26}O_3NF \cdot 0.30 H_2O$: C, 74.23; H, 6.14; N, 3.21; found: C, 74.16; H, 6.44; N,
2.96.

WHAT IS CLAIMED IS:

1. A compound having Formula I



I,

or a pharmaceutically acceptable salt or prodrug thereof, where R_1 is $-L_1-R_A$ where L_1 is selected from

- (1) a covalent bond,
- (2) $-O-$,
- (3) $-S(O)_t-$ where t is 0, 1, or 2,
- (4) $-C(X)-$,
- (5) $-NR_7-$ where R_7 is selected from
 - (a) hydrogen,
 - (b) aryl
 - (c) cycloalkyl of three to twelve carbons,
 - (d) alkanoyl where the alkyl part is one to twelve carbons,
 - (e) alkoxycarbonyl where the alkyl part is one to twelve carbons,
 - (f) alkoxycarbonyl where the alkyl part is one to twelve carbons and

is

substituted by 1 or 2 aryl groups,

- (g) alkyl of one to twelve carbons,
- (h) alkyl of one to twelve carbons substituted with 1 or 2

substituents

independently selected from

- (i) aryl and
- (ii) cycloalkyl of three to twelve carbons,
- (i) alkenyl of three to twelve carbons,
provided that a carbon of a carbon-carbon double bond is not attached directly to nitrogen,
- (j) alkynyl of three to twelve carbons,
provided that a carbon of a carbon-carbon triple bond is not attached directly to nitrogen,

- (6) $-\text{NR}_8\text{C}(\text{X})\text{NR}_9-$ where X is O or S and R_8 and R_9 are independently selected from

- (a) hydrogen,
 (b) aryl,
 (c) cycloalkyl of three to twelve carbons,
 (d) alkyl of one to twelve carbons,
 (e) alkyl of one to twelve carbons substituted with 1 or 2

substituents

independently selected from aryl or cycloalkyl of three to twelve carbons,

- (f) alkenyl of three to twelve carbons,
 provided that a carbon of a carbon-carbon double bond is not attached directly to nitrogen,
 (g) alkynyl of three to twelve carbons,
 provided that a carbon of a carbon-carbon triple bond is not attached directly to nitrogen,

- (7) $-\text{X}'\text{C}(\text{X})-$ where X is previously defined and X' is O or S,

- (8) $-\text{C}(\text{X})\text{X}'-$,

- (9) $-\text{X}'\text{C}(\text{X})\text{X}''-$ where X and X' are previously defined and X'' is O or S,

provided that when X is O, at least one of X' or X'' is O,

- (10) $-\text{NR}_8\text{C}(\text{X})-$,

- (11) $-\text{C}(\text{X})\text{NR}_8-$,

- (12) $-\text{NR}_8\text{C}(\text{X})\text{X}'-$,

- (13) $-\text{X}'\text{C}(\text{X})\text{NR}_8-$,

- (14) $-\text{SO}_2\text{NR}_8-$,

- (15) $-\text{NR}_8\text{SO}_2-$, and

- (16) $-\text{NR}_8\text{SO}_2\text{NR}_9-$

where (6)-(16) are drawn with their right ends attached to R_A and R_A is selected from

- (1) $-\text{OH}$,
 (2) $-\text{OG}$ where G is a $-\text{OH}$ protecting group,
 (3) $-\text{SH}$,
 (4) $-\text{CO}_2\text{R}_{20}$ where R_{20} is hydrogen or alkyl of one to twelve carbons,
 (5) alkoxycarbonyl,
 (6) $-\text{CN}$,
 (7) halo,
 (8) haloalkoxy of one to twelve carbons,

- (9) perfluoroalkoxy of one to twelve carbons,
(10) -CHO,
(11) -NR₇R_{7'} where R₇ is defined previously and R_{7'} is selected from
(a) hydrogen,
(b) aryl,
(c) cycloalkyl of three to twelve carbons,
(d) alkanoyl where the alkyl part is one to twelve carbons,
(e) alkoxycarbonyl where the alkyl part is one to twelve carbons,
(f) alkoxycarbonyl where the alkyl part is one to twelve carbons and
substituted by 1 or 2 aryl groups,
(g) alkyl of one to twelve carbons,
(h) alkyl of one to twelve carbons substituted with 1 or 2
substituents
independently selected from
(i) aryl and
(ii) cycloalkyl of three to twelve carbons,
(i) alkenyl of three to twelve carbons,
provided that a carbon of a carbon-carbon double bond is not
attached directly to nitrogen,
(j) alkynyl of three to twelve carbons,
provided that a carbon of a carbon-carbon triple bond is not
attached directly to nitrogen,
(12) -C(X)NR₈R₉,
(13) -OSO₂R₁₁ where R₁₁ is selected from
(a) aryl,
(b) cycloalkyl of three to twelve carbons,
(c) alkyl of one to twelve carbons,
(d) alkyl of one to twelve carbons substituted with 1, 2, 3, or 4 halo
substituents, and
(e) perfluoroalkyl of one to twelve carbons,
(14) alkyl of one to twelve carbons,
(15) alkenyl of two to twelve carbons,
provided that a carbon of a carbon-carbon double bond is not attached
directly to L₁ when L₁ is other than a covalent bond,
(16) alkynyl of two to twelve carbons,
provided that a carbon of a carbon-carbon triple bond is not attached
directly to L₁ when L₁ is other than a covalent bond,

where (14), (15), and (16) can be optionally substituted with 1, 2, or 3 substituents

independently selected from

- (a) alkoxy of one to twelve carbons,
- (b) -OH,
provided that no two -OH groups are attached to the same carbon,
- (c) -SH,
- (d) thioalkoxy of one to twelve carbons,
provided that no two -SH groups are attached to the same carbon,
- (e) -CN,
- (f) halo,
- (g) -CHO,
- (h) -NO₂,
- (i) haloalkoxy of one to twelve carbons,
- (j) perfluoroalkoxy of one to twelve carbons,
- (k) -NR₇R_{7'},
- (l) =NNR₇R_{7'},
- (m) -NR₇NR_{7'}R_{7''} where R₇ and R_{7'} are defined previously and R_{7''} is selected from
 - (i) hydrogen,
 - (ii) aryl,
 - (iii) cycloalkyl of three to twelve carbons,
 - (vi) alkanoyl where the alkyl part is one to twelve carbons,
 - (v) alkoxycarbonyl where the alkyl part is one to twelve carbons,
 - (vi) alkoxycarbonyl where the alkyl part is one to twelve carbons substituted by 1 or 2 aryl groups,
 - (vii) alkyl of one to twelve carbons,
 - (viii) alkyl of one to twelve carbons substituted with 1 or 2 substituents independently selected from aryl or cycloalkyl of three to twelve carbons,
 - (ix) alkenyl of three to twelve carbons,
provided that a carbon-carbon double bond is not attached
 - (x) alkynyl of three to twelve carbons,

provided that a carbon-carbon triple bond is not attached directly to nitrogen,

(n) $-\text{CO}_2\text{R}_{10}$ where R_{10} is selected from

(i) aryl,

(ii) aryl substituted with 1, 2, or 3 alkyl of one to twelve

carbon

substituents,

(ii) cycloalkyl of three to twelve carbons,

(iii) alkyl of one to twelve carbons, and

(iv) alkyl of one to twelve carbons substituted with aryl or cycloalkyl of three to twelve carbons,

(o) $-\text{C}(\text{X})\text{NR}_8\text{R}_9$,

(p) $=\text{N}-\text{OR}_{10}$,

(q) $=\text{NR}_{10}$,

(r) $-\text{S}(\text{O})_t\text{R}_{10}$,

(s) $-\text{X}'\text{C}(\text{X})\text{R}_{10}$,

(t) $(=\text{X})$, and

(u) $-\text{OSO}_2\text{R}_{11}$,

(17) cycloalkyl of three to twelve carbons,

(18) cycloalkenyl of four to twelve carbons,

provided that a carbon of a carbon-carbon double bond is not attached directly to L_1 when L_1 is other than a covalent bond,

where (17) and (18) can be optionally substituted with 1, 2, 3, or 4 substituents independently selected from

(a) alkyl of one to twelve carbons,

(b) aryl,

(c) alkoxy of one to twelve carbons,

(d) halo,

(e) alkoxycarbonyl where the alkyl group is one to twelve carbons,

(f) $-\text{OH}$,

provided that no two $-\text{OH}$ groups are attached to the same

carbon,

(19) perfluoroalkyl of one to twelve carbons,

(20) aryl, and

(21) heterocycle

where (20) and (21) can be optionally substituted with 1, 2, 3, 4, or 5

substituents

independently selected from

- (a) alkyl of one to twelve carbons,
- (b) alkanoyloxy where the alkyl part is one to twelve carbons,
- (c) alkoxycarbonyl where the alkyl part is one to twelve carbons,
- (d) alkoxy of one to twelve carbons,
- (e) halo,
- (f) -OH,

provided that no two -OH groups are attached to the same carbon,

- (g) thioalkoxy of one to twelve carbons,
- (h) perfluoroalkyl of one to twelve carbons,
- (i) -NR₇R_{7'},
- (j) -CO₂R₁₀,
- (k) -OSO₂R₁₁, and
- (l) (=X);

R₂, **R₃**, and **R₄** are independently hydrogen or **R₁**; or

R₁ and **R₂** together are -X*-Y*-Z*- where X* is -O- or -CH₂-, Y* is -C(O)- or -(C(R₁₂)(R₁₃))_v - where R₁₂ and R₁₃ are independently hydrogen or alkyl of one to twelve carbons and v is 1, 2, or 3, and Z* is selected from -CH₂-, -CH₂S(O)_t-, -CH₂O-, -CH₂NR₇-, -NR₇-, and -O-;

L₂ is selected from

- (1) a covalent bond,
- (2) alkylene of one to twelve carbons,
- (3) alkylene of one to twelve carbons substituted with 1 or 2 substituents independently selected from
 - (a) spiroalkyl of three to eight carbon atoms,
 - (b) spiroalkenyl of five or eight carbon atoms,
 - (c) oxo,
 - (d) halo, and
 - (e) -OH,

provided that no two -OH groups are attached to the same

carbon,

- (4) alkynylene of two to twelve carbons,
- (5) -NR₇-,
- (6) -C(X)-,

- (7) -O-, and
- (8) -S(O)_t-; and

R₅ is selected from

- (1) halo,
- (2) hydrogen,
- (3) -C(=NR₇)OR₁₀,
- (4) -CN,

provided that when R₅ is (1), (2), or (3), L₂ is a covalent bond,

- (5) alkyl of one to twelve carbons,
- (6) alkynyl two to twelve carbons,
provided that a carbon of a carbon-carbon triple bond is not attached
directly

to L₃ when L₃ is other than a covalent bond,

- (7) cycloalkyl of three to twelve carbons,
- (8) heterocycle,
- (9) aryl

where (5)-(9) can be optionally substituted with 1, 2, 3, 4, or 5 substituents
independently selected from

- (a) -OH,
provided that no two -OH groups are attached to the same

carbon,

- (b) -SH,
provided that no two -SH groups are attached to the same

carbon,

- (c) -CN,
- (d) halo,
- (e) -CHO,
- (f) -NO₂,

- (g) haloalkoxy of one to twelve carbons,
- (h) perfluoroalkoxy of one to twelve carbons,
- (i) -NR₈'R₉' where R₈' and R₉' are selected from

- (i) hydrogen,
- (ii) alkanoyl where the alkyl part is one to twelve carbons,
- (iii) alkoxycarbonyl where the alkyl part is one to twelve
- (iv) alkoxycarbonyl where the alkyl part is one to twelve

carbons,

carbons

- and is substituted with 1 or 2 phenyl substituents,
- (v) cycloalkyl of three to twelve carbons,
- (vi) alkyl of one to twelve carbons,
- (vii) alkyl of one to twelve carbons substituted with 1, 2, or 3 substituents independently selected from alkoxy of one to twelve carbons, cycloalkyl of three to twelve carbons, aryl, and alkoxycarbonyl where the alkyl group is one to twelve carbons,
- (viii) alkenyl of three to twelve carbons, provided that a carbon of a carbon-carbon double bond is not directly attached to nitrogen,
- (ix) alkynyl of three to twelve carbons, provided that a carbon of a carbon-carbon triple bond is directly attached to nitrogen,
- (x) $-C(O)NR_XR_Y$ where R_X and R_Y are independently selected from hydrogen and alkyl of one to twelve carbons,
- (xi) alkoxy of one to twelve carbons,
- (xii) aryl, and
- (xiii) aryl substituted with 1, 2, 3, 4, or 5 substituents independently selected from alkyl of one to twelve carbons, alkanoyloxy where the alkyl part is one to twelve carbons, alkoxycarbonyl where the alkyl part is one to twelve carbons, alkoxy of one to twelve carbons, halo, -OH provided that no two -OH groups are attached to the same carbon,
- thioalkoxy of one to twelve carbons,
- perfluoroalkyl of one to twelve carbons,
- $-NR_7R_7'$,

-CO₂R₁₀,
 -OSO₂R₁₁, and

(=X), or

R_g' and R_g' together with the nitrogen atom to which they are
 attached form a ring selected from

- (i) aziridine,
- (ii) azetidine,
- (iii) pyrrolidine,
- (iv) piperidine,
- (v) pyrazine,
- (vi) morpholine,
- (vii) phthalimide,
- (viii) thiomorpholine, and
- (ix) thiomorpholine sulfone

where (i)-(ix) can be optionally substituted with 1, 2, or 3 alkyl

of

one to twelve carbon substituents,

- (j) =NNR_g'R_g'
- (k) -NR₇NR_g'R_g'
- (l) -CO₂R₈,
- (m) -C(X)NR_g'R_g'
- (n) =N-OR₈,
- (o) =NR₈,
- (p) -S(O)_tR₁₀,
- (q) -X'C(X)R₈,
- (r) (=X),
- (s) -O-(CH₂)_q-Z-R₁₀ where R₁₀ is defined previously, q is 1, 2, or

3,

and Z is O or -S(O)_t-,

- (t) -OC(X)NR_g'R_g'
- (u) -OSO₂R₁₁,
- (v) alkanoyloxy where the alkyl group is one to twelve carbons,
- (w) -LBR₃₀ where L_B is selected from

- (i) a covalent bond,
- (ii) -O-,
- (iii) -S(O)_t-, and
- (iv) -C(X)- and
 R₃₀ is selected from

- not
5 bond,
- not
10 bond,
- (i) alkyl of one to twelve carbons,
(ii) alkenyl of one to twelve carbons,
provided that a carbon of a carbon-carbon double bond is
attached directly to LB when LB is other than a covalent
- (iii) alkynyl of one to twelve carbons,
provided that a carbon of a carbon-carbon triple bond is
attached directly to LB when LB is other than a covalent
- where (i), (ii), and (iii) can be optionally substituted with
cycloalkyl of three to twelve carbons,
-OH,
15 provided that no two -OH groups are attached to the same
carbon,
halo,
alkoxy of one to twelve carbons,
thioalkoxy of one to twelve carbons,
20 -NR₈R₉,
-O-(CH₂)_q-Z-R₁₀,
alkoxycarbonyl where the alkyl group is one to twelve
carbons,
alkanoyloxy where the alkyl group is one to twelve
25 carbons,
-NR₇SO₂-(alkyl of one to twelve carbons),
-OSO₂-(alkyl of one to twelve carbons),
aryl, and
heterocycle,
- 30 (iv) aryl,
(v) aryl substituted with 1, 2, 3, 4, or 5 substituents
independently selected from
alkyl of one to twelve carbons,
halo,
35 -NO₂, and
-OH,
provided that no two -OH groups are attached to
- the

same carbon,

- (vi) heterocycle, and
- (vii) heterocycle substituted with 1, 2, 3, 4, or 5 substituents independently selected from

alkyl of one to twelve carbons,

halo,

-NO₂, and

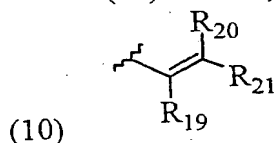
-OH,

provided that no two -OH groups are attached to

the

same carbon,

- (x) -X'C(X)X''R₁₀,
- (y) -NHC(O)NHNH₂,
- (z) alkenyl of two carbons,
- (aa) -C(=NR₇)OR₁₀, and
- (bb) -NR₇(X)NR₈R₉,



provided that when R₅ is (9), L₃ is other than -NR₇- or -O-, where the carbon-carbon double bond is in the Z or E configuration, and R₁₉, R₂₀, and R₂₁ are independently selected from

- (a) hydrogen,
- (b) halo,
- (c) alkoxycarbonyl where the alkyl group is of one to twelve

carbons,

- (d) alkyl of one to twelve carbons, and
- (e) alkyl of one to twelve carbons substituted with
 - (i) alkoxy of one to twelve carbons,
 - (ii) -OH,

provided that no two -OH groups are attached to the same carbon,

- (iii) -SH,

provided that no two -SH groups are attached to the same carbon,

- (iv) -CN,
- (v) halo,
- (vi) -CHO,

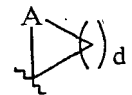
- (vii) $-\text{NO}_2$,
 (viii) haloalkoxy of one to twelve carbons,
 (ix) perfluoroalkoxy of one to twelve carbons,
 (x) $-\text{NR}_8\text{R}_9$
 5 (xi) $=\text{NNR}_8\text{R}_9$,
 (xii) $-\text{NR}_7\text{NR}_8\text{R}_9$,
 (xiii) $-\text{CO}_2\text{R}_{10}$,
 (xiv) $-\text{C}(\text{X})\text{NR}_8\text{R}_9$,
 (xv) $=\text{N}-\text{OR}_{10}$,
 10 (xvi) $=\text{NR}_{10}$,
 (xvii) $-\text{S}(\text{O})_t\text{R}_{10}$,
 (xviii) $-\text{X}'\text{C}(\text{X})\text{R}_{10}$,
 (xix) $(=\text{X})$,
 (xx) $-\text{O}-(\text{CH}_2)_q-\text{Z}-\text{R}_{10}$,
 15 (xxi) $-\text{OC}(\text{X})\text{NR}_8\text{R}_9$,
 (xxii) $-\text{LB}\text{R}_{30}$,
 (xxiii) alkanoyloxy where the alkyl group is one to twelve
 carbons,
 (xxiv) $-\text{OSO}_2\text{R}_{11}$, and
 20 (xxv) $-\text{NR}_7(\text{X})\text{NR}_8\text{R}_9$, or
 R_{20} and R_{21} together are selected from
 (a) cycloalkyl of three to twelve carbon atoms,
 (b) cycloalkenyl of four to twelve carbon atoms, and
 (c) $\begin{array}{c} \text{R}_{22} \\ \diagup \\ \text{C} \\ \diagdown \\ \text{R}_{23} \end{array}$ (allene) where R_{22} and R_{23} are independently
 25 hydrogen or alkyl of one to twelve carbons, and
 (11) cycloalkenyl of four to twelve carbons
 where the cycloalkenyl group or the ring formed by R_{20} and R_{21} together can
 be
 optionally substituted with one or two substituents independently
 30 selected
 from
 (a) alkoxy of one to twelve carbons,
 (b) $-\text{OH}$,
 provided that no two $-\text{OH}$ groups are attached to the same
 35 carbon,
 (c) $-\text{SH}$,

provided that no two -SH groups are attached to the same carbon,

- (d) -CN,
- (e) halo,
- (f) -CHO,
- (g) -NO₂,
- (h) haloalkoxy of one to twelve carbons,
- (i) perfluoroalkoxy of one to twelve carbons,
- (j) -NR₈'R₉'
- (k) =NNR₈'R₉'
- (l) -NR₇NR₈'R₉'
- (m) -CO₂R₁₀,
- (n) -C(X)NR₈'R₉'
- (o) =N-OR₁₀,
- (p) =NR₁₀,
- (q) -S(O)_tR₁₀,
- (r) -X'C(X)R₁₀,
- (s) (=X),
- (t) -O-(CH₂)_q-Z-R₁₀,
- (u) -OC(X)NR₈'R₉'
- (v) -LBR₃₀,
- (w) alkanoyloxy where the alkyl group is one to twelve carbons,
- (x) -OSO₂R₁₁, and
- (y) -NR₇(X)NR₈'R₉'

R₆ is hydrogen or alkyl of one to twelve carbon atoms; or

-L₂-R₅ and **R₆** together are selected from

- (1) =O,
- (2)  where $\square$ is 1, 2, 3, or 4 and A is selected from
 - (a) -CH₂-
 - (b) -O-
 - (c) -S(O)_t, and
 - (d) -NR₇-, and

(3) $\begin{array}{c} \text{R}_{26} \\ \text{=C} \\ \text{R}_{26'} \end{array}$ where the carbon-carbon double bond can be in the E or Z configuration and R₂₆ and R_{26'} are independently selected from

- (a) hydrogen,
- (b) alkenyl of three to twelve carbons,
- (c) aryl,
- (d) heterocycle,
- (e) alkyl of one to twelve carbons,
- (f) cycloalkyl of three to twelve carbons,
- (g) cycloalkenyl of four to twelve carbons, and
- (h) cycloalkenyl of four to twelve carbons where (a)-(f) can be optionally substituted with 1, 2, 3, 4, or 5 substituents independently selected from
 - (i) alkoxy of one to twelve carbons,
 - (ii) -OH,
provided that no two -OH groups are attached to the same carbon,
 - (iii) -SH,
provided that no two -SH groups are attached to the same carbon,
 - (iv) -CN,
 - (v) halo,
 - (vi) -CHO,
 - (vii) -NO₂,
 - (viii) haloalkoxy of one to twelve carbons,
 - (ix) perfluoroalkoxy of one to twelve carbons,
 - (x) -NR₈'R₉'
 - (xi) =NNR₈'R₉'
 - (xii) -NR₇NR₈'R₉'
 - (xiii) -CO₂R₁₀,
 - (xiv) -C(X)NR₈'R₉'
 - (xv) =N-OR₁₀,
 - (xvi) =NR₁₀,
 - (xvii) -S(O)_tR₁₀,
 - (xviii) -X'C(X)R₁₀,
 - (xix) (=X),
 - (xx) -O-(CH₂)_q-Z-R₁₀,

(xxi) $-\text{OC}(\text{X})\text{NR}_8'\text{R}_9'$,(xxii) $-\text{LBR}_{30}$,

(xxiii) alkanoyloxy where the alkyl group is one to twelve

carbons,

(xxiii) $-\text{OSO}_2\text{R}_{11}$, and(xxiv) $-\text{NR}_7(\text{X})\text{NR}_8'\text{R}_9'$;

R_{16} and R_{16}' are independently hydrogen or alkyl of one to six carbons; or
 R_{16} and R_{16}' together are alkenyl of two carbons;

a broken line represents the optional presence of a double bond,
 provided that when R_{16} and R_{16}' together are alkenyl of two carbons, the

double

bond is not present;

Y is selected from carbon, nitrogen, and $\text{N}^+(\text{=O}^-)$;

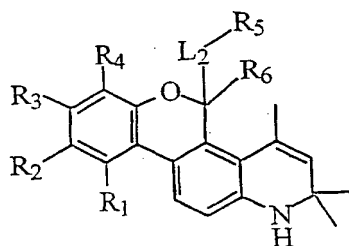
R_{17} is absent or hydrogen or alkyl of one to six carbons,
 provided that when the double bond is present, and Y is nitrogen or $\text{N}^+(\text{=O}^-)$,
 R_{17} is absent; and

R_{18} and R_{18}' are independently hydrogen or alkyl of one to six carbons; or
 R_{18} and R_{18}' together are a cycloheteroalkyl ring or a cycloalkyl ring of three

to

eight carbons.

2. A compound according to Claim 1 of Formula II



II,

or a pharmaceutically acceptable salt or prodrug thereof, where
 R_1 , R_2 , R_3 , R_4 , R_5 , R_6 , and L_2 , are defined above.

3. A compound according to Claim 2 where R_1 is $-L_1-R_A$, L_1 is $-O-$ or $-S-$, and R_A is alkyl of one to twelve carbons that can be optionally substituted, or R_1 and R_2 together are $-X^*-Y^*-Z^*-$.

- 5 4. A compound according to Claim 3 selected from
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-phenyl-1H-[1]benzopyrano[3,4-
 f]quinoline 1H-[1]benzopyrano[3,4-f]quinoline,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-
 [1]benzopyrano[3,4-
 10 f]quinoline,
 10-(difluoromethoxy)-2,5-dihydro-2,2,4-trimethyl-5-(2-propenyl)-1H-
 [1]benzopyrano[3,4-f]quinoline,
 10-ethoxy-2,5-dihydro-2,2,4-trimethyl-5-phenyl-1H-[1]benzopyrano[3,4-
 f]quinoline,
 15 5-(3-bromo-5-methylphenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
 [1]benzopyrano[3,4-f]quinoline,
 3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
 5-
 yl)phenol, acetate (ester),
 20 3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
 5-
 yl)phenol,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[[3-(methylthio)methoxy]phenyl]-
 1H-
 25 [1]benzopyrano[3,4-f]quinoline,
 [3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
 f]quinolin-5-yl)phenyl] dimethylcarbamate,
 5-[3-(2-furanyl)-5-methylphenyl]-2,5-dihydro-10-methoxy-2,2,4-trimethyl
 1H-[1]benzopyrano[3,4-f]quinoline,
 30 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-methyl-5-(1-
 morpholinyl)phenyl]-
 1H-[1]benzopyrano[3,4-f]quinoline,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(phenylmethylene)-1H-
 [1]benzopyrano[3,4-f]quinoline,
 35 5-(3,5-dichlorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
 [1]benzopyrano[3,4-f]quinoline,
 5-butyl-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
 f]quinoline,

- 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-(trifluoromethyl)phenyl]-1H-
[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-5-(4-methoxyphenyl)-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
5 5-(3-chlorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(3-methylphenyl)-1H-
[1]benzopyrano[3,4-f]quinoline,
(±)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-phenyl-1H-[1]benzopyrano[3,4-
10 f]quinoline,
(±)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-phenyl-1H-[1]benzopyrano[3,4-
f]quinoline,
5-(3,5-dimethylphenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
15 5-(4-chlorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
5-(3,4-dimethylphenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
5-(4-fluorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
20 [1]benzopyrano[3,4-f]quinoline,
5-[3,5-bis(trifluoromethyl)phenyl]-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
(-)-5-(3,5-dichlorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
25 (+)-5-(3,5-dichlorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
5-(3,5-difluorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4,N-tetramethyl-N-phenyl-1H-
30 [1]benzopyrano[3,4-f]quinolin-5-amine,
(-)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-
[1]benzopyrano[3,4-f]quinoline,
(+)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(2-propenyl)-1H-
[1]benzopyrano[3,4-f]quinoline,
35 2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
4-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
5-yl)-N,N-dimethylbenzenamine,

- 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(5-methoxy-2-thienyl)-1H-[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(5-propyl-2-thienyl)-1H-[1]benzopyrano[3,4-f]quinoline,
5 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[4-(1-morpholinyl)phenyl]-1H-[1]benzopyrano[3,4-f]quinoline,
1-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-5-yl)-3,3-dimethyl-2-butanone,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline-5-carbonitrile,
10 1-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-5-yl)-2-propanone,
methyl-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline-5-acetate,
15 2-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-5-yl)-1-phenylethanone,
5-[2-(chloromethyl)-2-propenyl]-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-(-methylene-1H-[1]benzopyrano[3,4-f]quinoline-5-propanol, acetate (ester),
20 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(4-methylphenyl)-1H-[1]benzopyrano[3,4-f]quinoline,
5-(3-fluoro-4-methylphenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
25 5-(3-bromophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(phenylmethyl)-1H-[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-propyl-1H-[1]benzopyrano[3,4-f]quinoline,
30 5-(4-fluorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
5-(3-fluorophenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
35 2,5-dihydro-10-methoxy-2,2,4,5-tetramethyl-1H-[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(1-methylethyl)-1H-[1]benzopyrano[3,4-f]quinoline,

- 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(2-methylpropyl)-1H-[1]benzopyrano[3,4-f]quinoline,
 5-ethyl-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
 5 2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline-5-carboximidic acid ethyl ester,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-(-methylene 1H-[1]benzopyrano[3,4-f]quinoline-5-propanol,
 2,5-dihydro-10-methoxy-2,2,4,N,N-pentamethyl-1H-[1]benzopyrano[3,4-f]quinoline-5-acetamide,
 10 2,5-dihydro-10-methoxy-2,2,4,N,N-pentamethyl-1H-[1]benzopyrano[3,4-f]quinoline-5-ethanamine,
 N-cyclopropyl-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline-5-acetamide,
 15 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-(2-propynyl)-1H-[1]benzopyrano[3,4-f]quinoline,
 5-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-yl)-2(5H)-furanone,
 20 5-(3-butenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline-5-propanol,
 25 5-(3,5-dichlorophenyl)-10-ethoxy-2,5-dihydro-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
 10-(bromodifluoromethoxy)-2,5-dihydro-2,2,4-trimethyl-5-(2-propenyl)-1H-[1]benzopyrano[3,4-f]quinoline,
 30 3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-yl)phenyl] methylcarbonate,
 5-2,5-dihydro-10-methoxy-5-(3-methoxyphenyl)-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-(2-propenyloxy)phenyl]-1H-[1]benzopyrano[3,4-f]quinoline,
 35 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-(phenylmethoxy)phenyl]-1H-[1]benzopyrano[3,4-f]quinoline,
 5-[3-(cyclopropylmethoxy)phenyl]-2,5-dihydro-10-methoxy-2,2,4-trimethyl-

1H-[1]benzopyrano[3,4-f]quinoline,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-[2-(1-piperidinyl)ethoxy]phenyl]-
 1H-[1]benzopyrano[3,4-f]quinoline,
 5-(3-hexyloxyphenyl)-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
 5 [1]benzopyrano[3,4-f]quinoline,
 5-[3-(2,4-dinitrophenoxy)phenyl]-2,5-dihydro-10-methoxy-2,2,4-trimethyl-
 1H-[1]benzopyrano[3,4-f]quinoline,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-(2-propynyloxy)phenyl]-1H-
 10 [1]benzopyrano[3,4-f]quinoline,
 3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
 5-yl)phenol-4-methylbenzenesulfonate (ester),
 4-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
 5-yl)phenolacetate (ester),
 4-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
 15 5-yl)phenol,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[[4-(methylthio)methoxy]phenyl]-
 1H-[1]benzopyrano[3,4-f]quinoline,
 [4-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
 5-yl)phenyl] dimethylcarbamate,
 20 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[4-(phenylmethoxy)phenyl]-1H-
 [1]benzopyrano[3,4-f]quinoline,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-(methoxymethoxy)phenyl]-1H-
 [1]benzopyrano[3,4-f]quinoline,
 [(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
 25 5-yl)phenyl] 1-morpholinecarboxylate,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-
 [(methylsulfinyl)methoxy]phenyl]-
 1H-[1]benzopyrano[3,4-f]quinoline,
 30 O-[3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
 f]quinolin-5-yl)phenyl] ester,
 2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-(methylthio)phenyl]-1H-
 [1]benzopyrano[3,4-f]quinoline,
 O-[3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
 35 f]quinolin-5-yl)phenyl] methylcarbonothioate,
 [3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl)-1H-[1]benzopyrano[3,4-
 f]quinolin-
 5-yl)phenyl] trifluoromethanesulfonate,

5-[3-(4,5-dihydro-4,4-dimethyl-2-oxazolyl)phenyl]-2,5-dihydro-10-methoxy-
2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinoline,
ethyl 3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
f]quinolin-5-yl)benzoate,
5 3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
5-yl)benzoic acid,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-methyl-5-(2-propenyl)phenyl]-
1H-[1]benzopyrano[3,4-f]quinoline,
10 1-[3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
f]quinolin-5-yl)-5-methylphenyl]ethanone,
3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
5-yl)-5-trimethylbenzenemethanol,
15 5-[3-(2-furanyl)phenyl]-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[3-methyl-5-(1H-pyrrolidin-1-
yl)phenyl]-1H-[1]benzopyrano[3,4-f]quinoline,
3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
20 5-methyl)-5,N-dimethylbenzenamine,
3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
5-yl)-5-methyl-N-(2-propenyl)benzamide,
3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
25 5-yl)-N-(2-methoxyethyl)-5-methylbenzenamine,
3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-f]quinolin-
5-yl)-N-(2-propenyl)benzenamine,
N'-[3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
f]quinolin-5-yl)-5-methylphenyl]-N,N-dimethylurea,
30 N-[3-(2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-[1]benzopyrano[3,4-
f]quinolin-5-yl)phenyl]benzenemethanamine,
5-[(3,5-dichlorophenyl)methylene]-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
[1]benzopyrano[3,4-f]quinoline,
5-[(4-chlorophenyl)methylene]-2,5-dihydro-10-methoxy-2,2,4-trimethyl-1H-
35 [1]benzopyrano[3,4-f]quinoline,
2,5-dihydro-10-methoxy-2,2,4-trimethyl-5-[[3-
(trifluoromethyl)phenyl]methylene]-1H-[1]-benzopyrano[3,4-f]quinoline,